

## In support of an OT-DM model: Evidence from clitic distribution in Degema serial verb constructions

This paper provides support for a modified DM model which I call Optimality Theoretic Distributed Morphology (OT-DM). The strongest form of this model is that all morphological operations take place in parallel, which I call the Morphology-in-Parallel Hypothesis (MPH). Although combining OT and DM is unorthodox in practice, I show that a growing body of data warrants this modification (Trommer 2001a, 2001b, 2002; Dawson 2017; Foley *to appear*; a.o.). I provide support for OT-DM from the distribution of verbal clitics in Degema, a language of southern Nigeria. Within, I argue that agreement clitics are inserted post-syntactically via the DM operation Dissociated Node Insertion (DNI), and further that verb complexes are formed post-syntactically via the operation Local Dislocation (LD), operating in tandem with a well-formedness markedness constraint which requires verbs to appear in properly inflected words. These DM operations are decomposed into a series of constraints which are crucially ranked. Candidates are freely generated from GEN and are subject to all DM operations, and are evaluated via EVAL against the ranked constraint set. I illustrate that under the standard serial DM model in which DNI proceeds VI, this would result in the wrong output form, and that even after parameterizing DM operation order in response, this model does not adequately account for the morphological patterns.

Morphosyntax/Phonology Interface  
 Distributed Morphology  
 Optimality Theory  
 clitics  
 serial verb constructions  
 African linguistics  
 morphological conspiracy

## 1. Introduction

This paper seeks to contribute towards refining a generative model of the interface between syntax and phonology. As a starting point, I adopt the major tenets of Distributed Morphology (DM) (Halle & Marantz 1993), one of which being that the syntactic module generates a structure which is then manipulated by post-syntactic, morphological operations. These operations include vocabulary insertion, linearization, local dislocation, prosodic inversion, impoverishment, fusion, fission, dissociated node insertion, among others. The orthodox view of DM is that it has a localist rather than globalist architecture (Embick 2010), within which these operations take place serially in a specific order (e.g. Embick & Noyer 2001, Arregi & Nevins 2012, Guseva & Weisser 2018, a.o.).

In contrast to this view, this paper maintains the core assumptions of DM but implements it within a constraint-based Optimality Theory (OT) model, which I call **Optimality Theoretic Distributed Morphology (OT-DM)**. The strongest form of this model is that all morphological operations take place in parallel, which I call the **Morphology-in-Parallel Hypothesis (MPH)**. Although combining OT and DM is unorthodox in practice, I show that a growing body of work overtly or covertly adopts it (Trommer 2001a, 2001b, 2002; Dawson 2017; Foley *to appear*; a.o.), and illustrate that an OT-DM model is necessary to account for the distribution of clitics in serial verb constructions in Degema, a language of southern Nigeria.

The core data from Degema involve the distribution of verbal clitics in serial verb constructions. All verbs are marked with a proclitic expressing subject agreement and (when applicable) an enclitic expressing aspect, resulting in a  $cl=[V]=cl$  structure. In serial verb constructions, when the verbs are adjacent or when only a prosodically light pronoun intervenes, the proclitic appears on the first verb and the enclitic appears on the last verb. I refer to this as the **single-marking clitic pattern**. In contrast, when the verbs are separated by a prosodically heavy constituent, each verb is marked by a proclitic and enclitic. I refer to this as the **double-marking pattern**. These patterns are in complementary distribution, shown below.

$V_1$ ___ $V_2$	Double-marking	Single-marking
$\emptyset$	* $cl=[V_1]=cl$ $cl=[V_2]=cl$	✓ $cl=[V_1 V_2]=cl$
$Pron_\sigma$	* $cl=[V_1 D_\sigma]=cl$ $cl=[V_2]=cl$	✓ $cl=[V_1 D_\sigma V_2]=cl$
$DP/Pron_{\sigma\sigma}$	✓ $cl=[V_1]=cl$ $DP/D_{\sigma\sigma}$ $cl=[V_2]=cl$	* $cl=[V_1 DP/D_{\sigma\sigma} V_2]=cl$

Table 1: Complementary distribution of clitic marking in SVCs

Some of these clitics are analyzed as exposing agreement nodes which are inserted post-syntactically via the DM operation **Dissociated Node Insertion (DNI)**. Furthermore, I analyze the verb complex in single-marking structures as a single morphological word which is formed post-syntactically via the operation **Local Dislocation**

(LD). These constraints operate in parallel with a well-formedness markedness constraint which requires verbs to appear in properly inflected words, and together can be understood as forming a **morphological conspiracy** in the sense of Kisseberth (1970). Informally, if the verbs are sufficiently local defined prosodically, they may form a constituent to ‘share’ the clitic marking resulting in single-marking via LD; if however they are not sufficiently local, each verb receives its own set resulting in double-marking.

I capture these patterns within the OT-DM model. DM operations are decomposed into a series of constraints which are crucially ranked, e.g. LD is decomposed into markedness constraints (e.g. MWD=PRWD), Alignment constraints (e.g. ALIGN-/asp/-R), and mapping constraints (e.g. LinearityMap-IO, MAP(WD\_TYPE)). Candidates are freely generated from GEN and are subject to all DM operations, and evaluated via EVAL against the ranked constraint set. Under OT-DM, DM operations are freely licensed but only those candidates which are selected as optimal surface and demonstrate their effects. I illustrate how this model correctly generates the Degema clitic patterns, and I contrast it against a serial rule-based DM account. I illustrate that under the standard serial DM model in which DNI proceeds VI, this would result in the wrong output form, and that even after parameterizing DM operation order in response, this model does not adequately account for the morphological conspiracy. In the appendix, I further argue against two alternatives: a syntax-only account of single-marking as syntactic verb movement, and an account of single-marking as deletion-under-identity of intermediate clitics.

This paper is organized as follows. Section 2 presents the major tenets of DM, and compares two different DM models, Rules & Constraints DM vs. OT-DM. Section 3 presents the core data involving clitics in Degema serial verb constructions, as well as core assumptions of the syntax of these structures. Section 4 presents a first pass DM analysis, introducing post-syntactic DM operations (DNI and LD), and illustrates how evidence from grammatical tone supports the constituency of V+V verb clusters under adjacency. Section 5 presents the core of the OT-DM analysis, introducing the constraint set, the candidate set, and the evaluation, and discusses some ramifications for post-syntactic architecture. Section 6 provides the conclusion, and three appendices are included which further detail the OT model and argue against alternatives.

## 2. Distributed Morphology, conspiracies, and constraints

### 2.1. Context of DM

One prominent linguistic theory which emerged in parallel with both Minimalism and Optimality Theory was **Distributed Morphology (DM)** (Halle & Marantz 1993, 1994; Halle 1997; Marantz 1997; Harley & Noyer 1999; Embick & Noyer 1999, 2001, 2007; Embick 2007a, 2007b, 2010; Embick & Marantz 2008; Siddiqi 2009, 2010; Arregi & Nevins 2012; Matushansky & Marantz 2013; Bobaljik 2017; a.o.). The core analytic move of DM is that morphology is distributed across several components of grammar. Traditional ‘morphemes’ are decomposed into morphosyntactic feature bundles, i.e. roots and functional heads from the **Feature Lexicon** (=narrow lexicon – Marantz 1997:204), which are manipulated by standard syntactic operations. Other components of the traditional ‘morpheme’ are filled in post-syntactically.

Conceptually, DM’s theoretical commitments can be distinguished by a number of tenets along several logically separate axes. I present these here not to describe the mechanics of DM *per se*, but rather to identify the commitments of DM as logically independent from one another, each of which is subject to re-evaluation if warranted by empirical findings.

#### (1) Tenets of DM

- a. **Module Order:** Syntax precedes morphology
- b. **Internal Complexity:** Internally complex words are the concatenation of morphosyntactic feature bundles
- c. **Uniform Concatenation:** Morphologically complex words are formed via the same operations concatenating words in clauses
- d. **Phonology-Free:** Syntax/semantics lack access to phonological features
- e. **Bundle Manipulation:** The output of feature bundles from syntax is manipulated via morphological operations
- f. **Feature Realization:** Vocabulary Items realize feature bundles with phonological information
- g. **Input-Output Mapping:** Input-to-output mapping is serial and rule-based

The first tenet **Module Order** is that syntax precedes ‘morphology’, as opposed to morphology forming constituents which are inserted into syntactic trees. Second, **Internal Complexity** states that internally complex words result from concatenation of morphosyntactic feature bundles. This is in contrast with **Inferential** models of morphology which posit no word-internal structure and derive morphologically complex words by root/stem manipulation, e.g. Anderson’s (1992) *A-Morphous Morphology* and Stump’s (2001) *Paradigm Function*

*Morphology* (see discussion in Inkelas 2014:241). Third, **Uniform Concatenation** states that morphologically complex words are formed via the same operations concatenating words in clauses, namely MERGE. This is therefore a strictly **Non-Lexicalist** theory of morphology, in which all words regardless of internal complexity have ‘syntax-all-the-way-down’ (Bobaljik 2017); ‘wordhood’ here is largely epiphenomenal. This contrasts with **Lexicalist** theories where there is a separate computational system which builds words independent from operations in syntax (see a thorough comparison in Siddiqi 2014). Fourth, syntax and semantics are **Phonology-Free** and lack the presence of and sensitivity to phonological features (“nodes consist entirely of morphosyntactic/semantic features and lack phonological features” - Halle & Marantz 1993:121). Fifth, **Bundle Manipulation** refers to the output of syntax - which consists of bundles of morphosyntactic features – able to be manipulated via morphological operations (or ‘adjustments’), e.g. adding or deleting features. Sixth, **Feature Realization** refers to the fact that **vocabulary items (VIs)** expone syntactic feature bundles and thereby realize syntactic features rather than introduce them (**Late Insertion** in DM terminology). This Realizational model contrasts with an Incremental model, in which the morphemes themselves introduce relevant syntactic/semantic features (terminology from Stump 2001). Finally, **Input-Output Mapping** refers to the fact that in standard DM, post-syntactic operations apply serially, formalized as ordered rules which can feed or bleed one another (e.g. Arregi & Nevins 2012).

It is only this last tenet that the OT-DM model challenges and is the focus for the rest of the paper; all other assumptions are maintained.

## 2.2. Morphological conspiracies

In rule-based phonological theory, a **conspiracy** refers to situations where rules with dissimilar inputs, outputs, and/or environments result in surface forms which all converge on or avoid a specific structure. The challenge of conspiracies for phonological theory was most famously presented in Kisseberth (1970) using data from Yokuts [yok] (=Yowlumne/Yawelmani; California, USA – Newman 1944). Yokuts has a number of rules involving vowel insertion, vowel deletion, and consonant deletion. In the simplified sample of rules is in (2), rules *i-Epenthesis* and *C-Deletion* have distinct inputs, outputs, and environments, but are both understood as avoiding a tautosyllabic consonant cluster (shorthand \*CC), i.e. a ‘derivational constraint’ on surface structures.

- (2) Rules in the Yokuts phonological conspiracy for \*CC
- a. *i-Epenthesis*:  $\emptyset \rightarrow i / C\_CC$
  - b. *C-Deletion*:  $C \rightarrow \emptyset / CC+\_$
  - c. *Final V-Deletion*:  $V \rightarrow \emptyset / VC\_\#$

Further, the non-application of a rule also conspires to avoid violating this constraint. *Final V-Deletion* in c. deletes word-final vowels if it is preceded by a VC sequence, but not if it is preceded by a CC sequence as this would create the banned surface structure.

Under a constraint-based model, these disparate rules thus receive a unified motivation. In the history of phonology, such conspiracies acted as catalysts in the development of parallel constraint-based evaluation in **Optimality Theory (OT)**, given that such conspiracies are in fact predicted from a constraint-based model and are not readily captured in a rule-based one (Prince & Smolensky 2004 [1993]; Kager 1999: Sec. 2.1.1.2; McCarthy 2002: Sec.3.1.4.3, 2008: 1-12; Bermúdez-Otero & Börjars 2006: 720; Kisseberth 2011; a.o.).

A **morphological conspiracy** therefore is surface structure convergence or avoidance involving morphological (i.e. non-phonological) inputs, outputs, and environments. Unlike in phonological theory, morphological conspiracies have played little role in the major developments of morphological theory. Despite their minor role, several morphological conspiracies have been identified in the literature. I highlight here two very different responses to conspiracies within DM theory, one maintaining ordered rules and the other proposing strictly parallel constraints. I argue in section 4 that the Degema data also constitute a morphological conspiracy.

## 2.3. Rules & Constraints DM

One response to morphological conspiracies is exemplified by Arregi & Nevins’ (2012) thorough investigation of Basque morphosyntax. They posit a series of ordered morphological modules in a rule-based DM model, summarized below.

- (3) Ordered morphological modules (Arregi & Nevins 2012:4)
- [...syntactic operations...]
1. Exponence Conversion (e.g. agree-copy, fission)
  2. Feature Markedness (e.g. participant dissimilation)
  3. Morphological Concord (e.g. complementizer agreement)

4. Linearization
  5. Linear Operations (e.g. clitic metathesis/doubling)
  6. Vocabulary Insertion
- [...phonological operations...]

Arregi & Nevins highlight a number of surface patterns across Basque dialects which conspire to place T° auxiliaries in a specific position. One such conspiracy is avoiding an auxiliary being initial in its relevant domain. Several processes “conspire to make T surface in second position”, which include cliticization of an absolutive marker (*Absolutive Cliticization*), metathesis and doubling of an ergative marker, whose application depends on the dialect (*Ergative Metathesis and Doubling*), and the insertion of an epenthetic dummy morpheme before T° (*L-Support*). To unify these distinct repairs, Arregi & Nevins posit a well-formedness constraint T-NONINITIALITY (Arregi & Nevins 2012: 276). This constraint acts as an inviolable filter that outputs must comply with, and triggers ‘repairs’ which vary by environment/module and by dialect.

By employing both rules and constraints, Arregi & Nevins propose a significant modification to the standard DM model, which I refer to as **Rules & Constraints Distributed Morphology (R&C DM)**. Their modification to DM’s rule-based architecture in response to output-oriented well-formedness conditions is directly parallel to the events in pre-OT phonology, such as Paradis’ (1987) *Constraints and Repair Strategies* (for further discussion see Prince & Smolensky 2004 [1993]: 247-252 and Kiparsky 2017: 396).

It is crucial to note that Rules & Constraints DM rejects a more radical OT model involving parallelism constraint based evaluation. The standard DM framework and the OT framework are often accepted as having conflicting assumptions, with Embick (2010:ix) explicitly stating that DM “is incompatible with the dominant view in phonological theory, Optimality Theory (OT), which posits competition among infinite sets of complex objects” (similar sentiments are observed by Tucker 2011:200). Most recently, Guseva & Weisser (2018) explicitly reject parallelism in their DM account of suspended affixation in the Uralic language Meadow Mari [mhr], citing counterfeeding opacity resulting from the order of post-syntactic operations (see especially their section 6.1).<sup>1</sup>

#### 2.4. OT-DM

A different set of data and conspiracies has generated the opposite response by other DM practitioners who have sought to incorporate OT into DM architecture, either explicitly or implicitly. I refer to this DM model as **Optimality Theoretic Distributed Morphology (OT-DM)**. Although there has been quite limited cross-pollination between the OT and DM frameworks, there was early research tying them together, noting in particular the fact that they emerged in the same (generative) linguistic period (e.g. Noyer 1992, 1993, 1994; Bonet 1994; see Wolf 2008:141). For example, some of the earliest integration (though not by name) include Noyer (1992) involving DM-style impoverishment “achieved by the interaction of inviolable surface constraints and universal feature hierarchies” (Trommer 2001a:71). Trommer’s own work (2001a, 2001b, 2002) explicitly conjoins these theories into what he refers to as *Distributed Optimality*, arguing that the “crucial mechanisms of DM can be replaced profitably by the interaction of violable constraints as in OT” (2001a:12). Models such as Rules & Constraints DM later proposed by Arregi & Nevins (2012) fall under what Trommer calls the *Filter & Hierarchy* approach to DM, a ‘filter’ being an inviolable (markedness) constraint. Trommer supports his program by citing a number of conspiracies, e.g. a conspiracy involving argument marking of transitive predicates in Dumi [dus] (van Driem 1993; Trommer 2001a:66-67,81-83,404-412), as well as cross-linguistic conspiracies such as an anti-homophony constraint resulting in clitic substitution in Italian but deletion in Spanish (Grimshaw 1997, Trommer 2001a:14).<sup>2</sup>

One recent OT-DM paper involving a morphological conspiracy is presented in Dawson (2017) for Tiwa [lax] (Sino-Tibetan: India). In Tiwa, Dawson identifies that verb roots are prosodically bound, requiring material to their right in the same prosodic word. She formalizes this morphophonological requirement with a markedness constraint \*BARE-V. In nearly all contexts, the verb appears with an overt suffix due to independent morphosyntactic requirements, and thereby vacuously satisfies the \*BARE-V constraint. One exception is with auxiliary verb constructions where an auxiliary selects a bare verb, in violation of \*BARE-V. To remedy this, Tiwa employs two

<sup>1</sup> It should be noted that constraints and their ‘repairs’ play no role in the majority of recent work in DM largely due to not being pertinent to the specific phenomenon at hand (e.g. Matushansky & Marantz eds. 2013<sup>1</sup>; Salzmann 2013; Haugen & Siddiqi 2013; Harley 2014; Shwayder 2015, Gribanova 2015; Watanabe 2015; Moskal 2015; Moskal & Smith 2016; Deal 2016; Saab & Lipták 2016; Martinović 2017; a.o.). As stated, an exception is Guseva & Weisser (2018).

<sup>2</sup> Wolf (2015:385) also cites conspiracies as a deciding factor in employing phonologically conditioned suppletive allomorphy via constraints rather than through arbitrary sub-categorization restrictions.

repairs in free variation. In one, the verb and the auxiliary integrate and form a single complex phonological word, with the verb cliticizing to the right-adjacent auxiliary. I refer to this as *Verb Cliticization*, shown in (4)a. Dawson argues that phonological wordhood of the V+Aux complex is supported by the fact that certain word medial consonants in this complex undergo intervocalic voicing. Further, in a second repair, a morphosyntactically higher Focus head which canonically attaches to the right edge of the language attaches instead to the verb. Dawson calls this *Focus Drift*, shown in (4)b. She provides a number of arguments that the position of the focus clitic does not express additional focus semantics on the verb, suggesting post-syntactic reconfiguration.

- (4) Tiwa repairs for constraint \*BARE-V
- a. Verb Cliticization: Complex phonological word formation  
 V Aux Foc → (V=Aux=Foc)  
 (ω lí=thái-do=sê )  
 lí      thái-do    =sê  
 go      AUX-IPFV   =FOC  
 ‘he is *still* going’
- b. Focus Drift: Cliticization of focus onto a verb  
 V Aux Foc → (V=Foc) (Aux)  
 (ω lí=sê ) (ω thái-do )  
 lí      =sê      thái-do  
 go      =FOC      AUX-IPFV  
 ‘he is *still* going’

These repairs form a conspiracy, as in both cases the output is a verb which receives an appropriate ‘host’ and thereby satisfies \*BARE-V. Dawson shows that these data cannot be reduced simply to DM operations Lowering or Local Dislocation (as well as prosodic inversion), and argues that the data warrants a model that “explicitly incorporates the constraint-driven component into DM” (p. 255).

Independently, Foley (to appear) recently discusses a morphological conspiracy involving multiple exponence in Georgian verbal paradigms, part of a larger program *Optimal Vocabulary Insertion*. Several other works envision more broadly some type of interaction between DM and OT(-like) components, including Haugen (2008, 2011), Wolf (2008), Lahne (2010), Tucker (2011), Günes (2015), Loutfi (2016), Brown (2017), and Sande (2017, 2018).<sup>3</sup>

### 3. Degema: core data and assumptions

#### 3.1. Inflectional clitics

Degema [deg] is a Benue-Congo language of the Niger-Congo phylum spoken in the Niger Delta region of southern Nigeria.<sup>4</sup> It is a head-initial language, and maintains a fairly strict SVO word order in which auxiliaries precede the verb and adjuncts follow the object (including adverbials, CPs, PPs, and ideophones). Degema possesses a series of inflectional proclitics and enclitics which obligatorily adjoin to the verb. Proclitics principally expone subject agreement, though can additionally index tense/aspect and polarity. Agreement proclitics form two sets. Set 1 are used in positive polarity, non-past tense constructions, and all begin with /m/; set 2 appear elsewhere and are vowel initial other than first person singular. Throughout this paper, clitics are marked with PHI-features and as SET1 or SET2. Third person plural is further split into two sets of markers: one which appears with third person plural human referents [+H], and those which appear with third person non-human referents [-H]. Tone and ATR variations involving these clitics are not indicated in Table 2, though are discussed below.

<sup>3</sup> Outside of DM, morphological theory has embraced and contributed to constraint-based modeling dialogues, summarized in Xu (2016). Examples include *Cophonology Theory* (Inkelas & Zoll 2007), *Optimal Construction Morphology* (Cabellero & Inkelas 2013), *Stratal OT* (Kiparsky 2015), a.o. Further, a particularly strong view of constraint-based modeling has been adopted by practitioners of OT Syntax, important works including Grimshaw (1997, a.o.), Legendre et al. (2001), Broekhuis & Vogel (2013), Legendre et al. (2016), a.o.

<sup>4</sup> Data for this paper comes from the extensive publications on Degema by native speaker-linguist Ethelbert E. Kari (Kari 1997, 2002a, 2002b, 2002c, 2002d, 2003a, 2003b, 2004, 2005a, 2005b, 2006, 2008), as well as ongoing joint collaboration (Rolle & Kari 2016). Additional consultation with a native Degema speaker was done in the summer of 2017 in Port Harcourt, Nigeria. Degema has two dialects, Usokun and ʔtala (the latter also called ‘Degema Town’). The current paper is based on the Usokun variety only. Information on the ʔtala dialect is found in a grammar by Offah (2000), which reveals a different distribution of clitics (see especially pps. 7, 30, 33, 46-48, 57, 66-70, 79; email me for a copy of this reference).

Infl proclitics	1 <sup>st</sup>		2 <sup>nd</sup>		3 <sup>rd</sup>			
	Set 1	Set 2	Set 1	Set 2	Set 1		Set 2	
SG	me	mi	mu	u	mo		o	
PL	me	e	ma	a	+H	-H	+H	-H
					me	mi	e	i

Table 2: Degema proclitics<sup>5</sup>

Degema has two inflectional enclitics which expone aspect. Factative aspect  $\acute{o}=\bar{V}n$  FAC express perfective aspect / past tense with eventive verbs and present tense with stative verbs. This clitic co-occurs with a high tone on the verb root, and copies the final vowel of the verb if it is vowel final. Additionally, the perfect aspect marker is  $\acute{o}=t\bar{e}$  PRF. Kari (2002a; 2002b; 2002c; 2002d; 2003; 2005) presents arguments that both proclitics and enclitics are clitics and not affixes, a position I adopt here but do not elaborate on or defend.<sup>6</sup> Clitics are illustrated in (5).

(5) Degema inflectional clitics<sup>7</sup>

- a. **me**=síré  
**1SG.SET1**=run  
 ‘I am running’ (Kari 2004:286)
- b. Ohoso **o**=sá=**n** ēnám Cf. \*Ohoso **o** sá=**n** ēnám / \*Ohoso **o**=sá **o** ēnám  
 Ohoso **3SG.SET2**=shoot=**FAC** animal  
 ‘Ohoso shot an animal’ (Kari 2004: 270)
- c. **mí**=dé=**té** ósama Cf. \***o** dé=**té** ósama / \***mí**=dé **o** ósama  
**1SG.SET2**=buy=**PRF** dress  
 ‘I have bought a dress’ (Kari 2004: 293)

The only elements which may intervene between the proclitic and the lexical verb are functional auxiliary verbs, a closed class with 12 members. Auxiliaries are outside of the scope here (although see the footnote at the end of section 4.4, and data in Appendix 3 within alternative 2).

Further, the only elements which may intervene between the enclitic and the lexical verb are prosodically light object pronouns. Example (6)a illustrates that when a verb and aspectual enclitic appears with a bisyllabic pronoun *oyí* 3SG ‘him/her/it’ or *ení* 1PL ‘us’, the enclitic adjoins to the verb. In contrast, (6)b-c show that if the verb appears with a monosyllabic pronoun, the enclitic must attach to the right edge of that pronoun, and not directly next to the verb. Other orders are ungrammatical.

## (6) Surface position of enclitics with monosyllabic object pronoun

- a. Osoabo **o**=kótú=**n** óyi Cf. \*Osoabo **o**=kótú óyi=**n**  
 Osoabo **3SG.SET2**=call=**FAC** him/her  
 ‘Osoabo called him/her’ (Kari 2004: 113)
- b. **o**=kótú wó=**ōn** Cf. \***o**=kótú=**n** wō  
**3SG.SET2**=call you=**FAC**  
 ‘(s)he called you’ (Kari 2004: 276)

<sup>5</sup>The distribution of these sets is more complex than this but falls outside of the scope of this paper. What is important to note is that these two sets are in syntactic complementary distribution. For comprehensiveness, a few additional comments should be made. In negative-imperative sentences, the second-person singular subject clitic is expone as *e/ε=*. A marginal subject clitic *a=* also exists, but only attaches to the bound copular verb *bə* ‘be present’ (Kari 2004, 2008: 21). And the non-human variant in 3PL also appears with mass nouns [+M], which have no singular/plural morphological distinction.

<sup>6</sup>Degema has four additional verb-adjacent enclitics which do not expone aspect, not discussed here. These are *=tu* ‘don’t do X’, *=munu* ‘stopped X’, *=vire* ‘too much’, and *=ani* ‘please’ (Kari 2004:340).

<sup>7</sup>Degema orthography is consistent with the IPA, with the following language-specific conventions: <ɸ> = /f/, <ɖ> = /d/, <ṅ> = /ŋ/, <nw> = /ŋʷ/, <ny> = /ɲ/, <y> = /j/, and <v> = /β/. A dot under a vowel indicates retracted tongue root [-ATR], and no dot under the vowel indicates advanced tongue root [+ATR]. ATR is only marked on the first vowel of the word, though ATR harmony applies to all vowels within the word. A high tone is indicated by an acute accent <V̄>, a downstepped high is indicated by a macron <V̄̄>, and a low tone is not marked.

- c. o=gídí                      b́áw=tē                      Cf. \*o=gídí=té b́áw  
 3SG.SET2=look.for      them=PRF  
 '(s)he has looked for them' (Kari 2004: 282)

These facts are summarized in the table below. The shading indicates the pattern where the enclitic attaches to pronoun rather than the verb.

	1	2	3	XP {NP/CP/PP/etc.}
SG	méē/měē V pron=CL	wóō V pron=CL	oyí V=CL pron	V=CL XP
PL	ení V=CL pron	máány/máány V pron=CL	b́áāw/b́áāw V pron=CL	

Table 3: Attachment of enclitic with object pronouns

### 3.2. Serial verb constructions

**Serial verb constructions (SVCs)** are a widespread linguistic feature of West Africa (Ameka 2005) and are used extensively in Degema. Non-formally, they are defined as a sequence of more than one verb in a single clause which share verbal arguments and functional categories. In Degema, SVCs are used to express event exhaustion/completion, directionals, benefactives, verbal comparison, comitatives, instrumentals, accompanimentals, refusal, simultaneousness, abilitatives, consequentials, and event coordination (resultatives and purposives are not expressed through SVCs; see Kari 2003a, 2004 for further details).

When inflectional clitics appear in SVCs, two patterns in complementary distribution are seen. One is the **double-marking pattern** in which each verb in series is marked with an identical proclitic and enclitic respectively, in (7)a. A second is the **single-marking pattern** in which only the first verb is marked with a proclitic while only the last verb is marked with an enclitic. This 'bookending' pattern is shown in (7)b.

#### (7) Clitic patterns

##### a. Double-marking SVC pattern

o=sóm=n                      úsī                      o=túl                      wó=ōn  
 3SG.SET2=be.good=FAC      beauty      3SG.SET2=reach      you=FAC  
 'He is as handsome as you.' (Kari 2004:157)

##### b. Single-marking SVC pattern

Ohoso o=sóm                      túl=n                      óyi  
 Ohoso 3SG.SET2=be.good      reach=FAC      him  
 'Ohoso is as handsome as him.' (Kari 2004:156)

The double-marking SVC pattern occurs when there is an intervening DP between the two verbs, i.e. the object *úsī* 'beauty' in a. In contrast, the single-marking pattern occurs when there is no such intervening object as in b.

The only exception to this generalization involve prosodically light object pronouns. When these light pronouns appear between the verbs, the single-marked SVC pattern occurs despite this intervening element. For example, in (8)a. the object pronoun is bisyllabic *óyi* 'her/him' and the SVC displays double-marking. In contrast, in b. the object pronoun is monosyllabic *me* 'me' and the SVC displays single-marking (recall from Table 2 that these same light pronouns also have a different distribution with respect to enclitics).

#### (8)

##### a. Double-marking pattern with bisyllabic pronoun

mī=ǰúw=n                      óyi                      mī=tá=ān  
 1SG.SET2=follow=FAC      her/him      1SG.SET2=go=FAC  
 'I went with her/him' (Kari 2004: 201)

##### b. Single-marking pattern with monosyllabic pronoun

Breno o=ǰúw                      mé tá=ān  
 Breno 3SG.SET2=follow      me go=FAC  
 'Breno went with me' (Kari 2004: 115)

In the double-marking environment where there is an intervening object (other than a prosodically light object), the single-marking pattern is ungrammatical here and both sets of clitics are obligatory.

- (9) Ungrammatical single-marking in presence of intervening object
- a. Tatane o=kótú=\*(**té**) éni \*(**o**)=kpéí=tē ínúm  
 Tatane 3SG.SET2=call=\*(**PRF**) us \*(**3SG.SET2**)=tell=PRF something  
 ‘Tatane has called us and told (us) something’ (Kari 2003a: 285)
- b. Tatane o=sá=\*(**n**) ěnám \*(**o**)=gbíyé=ěn  
 Tatane 3SG.SET2=shoot=\*(**FAC**) animal \*(**3SG.SET2**)=kill=FAC  
 ‘Tatane shot an animal dead’, ‘Tatane shot and killed an animal’ (Rolle & Kari 2016:146)

In contrast, in the single-marking environments where the verbs in series appear without an intervening object or only with a light object, the double-marking pattern is ungrammatical for some speakers but questionable or unnatural for others. This variation is detailed in Rolle & Kari (2016). The value <sup>(?)</sup> is acceptable but dispreferred, <sup>?</sup> is unnatural and dispreferred, and <sup>?</sup>\* is grammatically questionable; the slash indicates two different speakers intuitions. Acceptability increases with a prosodically light pronoun (b.). In general, examples with the factative enclitic =*ṽn* are more accepted than with perfect =*tē*.

- (10) Double-marking pattern interpretations (Rolle & Kari 2016:149-150)
- a. <sup>?</sup>\*Breno o=síré=ěn o=tá=ān  
 Breno 3SG.SET2=run=FAC 3SG.SET2=go=FAC  
 ‘Breno ran and went’
- b. <sup>(?)</sup>\*Breno o=vón mě=ěn o=yí=īn  
 Breno 3SG.SET2=take me=FAC 3SG.SET2=come=FAC  
 ‘Breno brought me’

The interpretations of these examples contrasts with those in (9) where single-marking is strongly rejected as ungrammatical. Even for those speakers who may more readily accept a double-marking pattern here, it is the more marked variant of the two, reflected by its virtually non-existing status in work on Degema.

Moreover, further consultation with another native speaker shows that he unequivocally rejects double-marking in single-marking context (11).

- (11) Ungrammaticality of double-marking in the single-marking context
- a. Ohoso o=tá>(\*=**n**) (\***o**)=dě=n isen  
 Ohoso 3SG.SET2=go(\*=**FAC**) (\***3SG.SET2**)=buy=FAC fish  
 ‘Ohoso went and bought fish’ [ohk\_201707]<sup>8</sup>
- b. Breno o=dúw mě(\*=**n**) (\***o**)=tá=ān  
 Breno 3SG.SET2=follow me(\*=**FAC**) (\***3SG.SET2**)=go=FAC  
 ‘Breno went with me’ [ohk\_201707]

Furthermore, for all speakers it is ungrammatical to have only one medial clitic in the single-marking context.<sup>9</sup>

- (12) Ungrammaticality of marking only one verb with double-marking

<sup>8</sup> Collected July and August 2017 in Port Harcourt, Nigeria.

<sup>9</sup> As pointed out by a reviewer, this distribution of grammatical morphemes makes Degema distinct from other cases of verbs ‘sharing’ the same marker. For example, in Dagaare SVCs (Hiraiwa & Bodomo 2008:823) the tense marker *dà* Past occurs only once, preceding V1 (and not V2), as in (i)-(ii) below. In contrast, the aspect suffix *-rṽ* Imperf appears on each verb in the sequence, as in (ii).

(i) ò dà sě lá něnè ðð  
 3sg Pst roast F meat eat  
 ‘He roasted meat and ate it’

(ii) ò dà sě-rě lá něnè ðð-rṽ  
 3sg Pst roast-Imperf F meat eat-Imperf  
 ‘He was roasting meat and eating it’

As I show in examples (12), (50)c, and (52), a parallel cl=V=cl V=cl structure is ungrammatical in Degema. I discuss Hiraiwa & Bodomo’s analysis and data further in the next section 3.3.



- a. Ohoso o=sóm (\*o=)túl=n óyi  
 Ohoso 3SG.SET2=be.good (\*3SG.SET2=)reach=FAC him/her  
 ‘Ohoso is as handsome as him.’ (Rolle & Kari 2016:150)
- b. Ohoso o=yí(\*=tḗ) kótú=té óyi  
 Ohoso 3SG.SET2=come(\*=PRF) call=PRF him/her  
 ‘Ohoso has come and called him’ (Kari 2003a: 285)

### 3.3. Syntax of SVCs

I adopt a modified version of Collins’ (1997, 2002) analysis of SVCs involving nested  $\nu$ P shells where  $V_1$  selects  $\nu_2$ P as its complement:  $[_{ASPP} ASP^\circ [_{\nu P} \nu_1^\circ [ V_1^\circ [_{\nu P} \nu_2^\circ [ V_2^\circ ] ] ] ] ]$ . This  $\nu$ P complementation structure is illustrated in Figure 1.

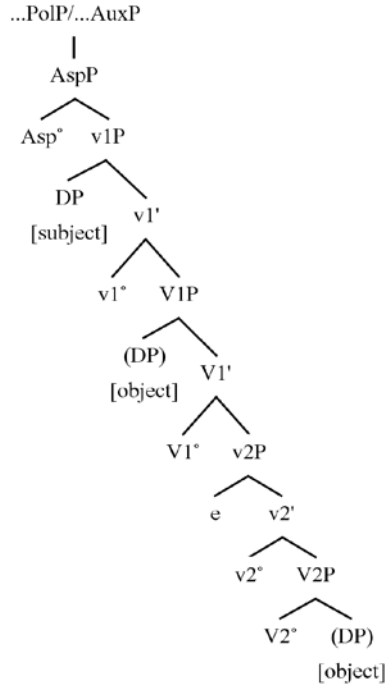


Figure 1:  $\nu$ P complementation structure:  $Asp > \nu_1 > V_1 > \nu_2 > V_2$

In this structure, only one set of functional heads occur, i.e. a single  $Asp^\circ$  head. The external argument (the subject) is base-generated in spec  $\nu_1$ P with a corresponding empty category  $e$  in spec  $\nu_2$ P (the latter’s technical identity is outside the scope of this paper). Internal arguments (objects) are base-generated in positions within VPs.

In order to license multiple verbs under a single set of verbal projections which are not within coordinate or subordinate structures, Collins posits a *Serialization Parameter* which states that a functional head  $I^\circ/T^\circ$  can license multiple Vs (Collins 1997: 493), and later modifies this as a little  $\nu^\circ$  able to license multiple Vs (Collins 2002: 8). In the version adopted here, I assume that the functional head  $Asp^\circ$  (or the functional field as a whole) license multiple  $\nu$ Ps. A similar structure is assumed in Carstens’ (2002) analysis of Ijo SVCs. Further, following much work in DM I assume that the Agr features which are exponed as the subject agreement proclitics are inserted post-syntactically (Embick & Noyer 2007, Kramer 2010, Norris 2014, a.o.). Therefore, no agreement (Agr $^\circ$ ) projections appear in the syntax itself.

Several alternative proposals for SVC syntax exist. One involves double-headedness and parallel structure (Baker 1989, Hiraiwa & Bodomo 2008), in which an object is simultaneously an argument of both  $V_1$  and  $V_2$ . Another involves VP adjunction where  $\nu_2$ P/ $V_2$ P is adjoined to the first verb projection (Baker & Stewart 2002). A third involves Aboh’s (2009) proposal that in SVCs,  $V_1$  is a functional projection while  $V_2$  is a lexical projection. I maintain that whichever syntactic structure is chosen, appealing only to syntax will be inadequate for accounting for the distribution of clitics in full. I present brief argumentation here; see alternative 1 in Appendix 3 for extended arguments.

Under a syntax-only view, the difference between the single-marking and double-marking patterns would be attributable to a syntactic operation, the most straightforward being an appeal to syntactic verb movement (e.g. as in

Collins 2002). Under the single-marking pattern, the constituency of the two verbs would be derived via overt syntactic head-movement, whether by V2 moving to V1 directly, or both V1 and V2 moving to the same higher functional head such as  $v_1$ . Under this alternative, single-marking is attributed to the verbs forming a complex syntactic head (a verbal compound) and are therefore inflected like non-compound verbs by a single set of clitics. Double-marking is attributed to the lack of syntactic verb movement under specific conditions resulting in the two verbs being spelled-out as separate words.

One argument against this is that there is no evidence that single-marking and the double-marking SVC clitic patterns represent distinct syntactic structures at any stage (whether involving distinct numeration types or distinct sets of syntactic operations). The two thus have the identical syntactic structure in Figure 1 (or one of the alternatives listed just above). Both single-marking and double-marking patterns involve the same types of functional categories, and both can be used with any type of lexical verb regardless of transitivity or other syntactic-semantic distinctions. To illustrate, the SVC *duw ta* ‘go with’ (lit. follow go) involves a transitive and intransitive verb. If the object of the transitive verb *duw* ‘follow’ appears in-situ between the verbs, the double-marking pattern occurs as in (13)a. In contrast, if the object is moved e.g. under  $\bar{A}$ -movement, the verbs become surface adjacent and the single-marking pattern occurs instead, shown in b.

(13) Syntax-equivalency of double-marking and single-marking (Rolle & Kari 2016:155)

- a. *mi=duw=n*                      *ovo*                      *mj=tá=an?*  
 1SG.SET2=follow=FAC **who**                      1SG.SET2=go=FAC  
 ‘I went with who?’
- b. *ovó; nù mi=duw*                      *ovó; tá=an?*  
**who** that 1SG.SET2=follow                      **who** go=FAC  
 ‘who did I go with?’

Further, the number of verbs in the SVC also plays no role in determining these patterns, as shown in (14) involving five verbs in series in a single-marking pattern.

- (14) Ohoso    *o=tá*                      *dé vó yí*                      *kíyé=n óyi*  
 Ohoso    3SG.SET2=go buy take come                      give=FAC him/her  
 ‘Ohoso went and bought (something) and brought (it) to him/her’ (Kari 2004: 121)

Second, double-marking arises whenever a prosodically heavy object intervenes between the two verbs, and single-marking otherwise. Under a syntax-only account, it would not be clear why the presence/absence or the prosodic weight of an object in an argument position would condition head movement of verbs. Bisyllabic pronouns would block verb movement (resulting in double-marking), while monosyllabic pronouns would allow it (resulting in single-marking). This would amount to syntax being sensitive to phonological information, a clear violation of modular architecture assumed in the standard Y-model of generative grammar.

As stated, I present more extensive argumentation against a syntax-only account in alternative 1 in Appendix 3.

### 3.4. A note on aspect in SVCs

A note needs to be made regarding aspect in SVCs. In the examples provided throughout, in the double-marking pattern the verbs share identical clitics, e.g. in (13)a above. However, in exactly one context the verbs bear different clitics. Recall that proclitics primarily expone subject agreement but the distribution of set 1 versus set 2 is conditioned by tense/aspect/polarity. In SVCs which express imperfective aspect (habitual or present continuous), however, the first verb is marked with a set 2 proclitic and the second verb is marked with a set 1 proclitic. This non-identical double-marking is found regardless of the presence of an intervening object.

(15) Obligatory non-identical proclitics in double-marking pattern expressing imperfective aspect in SVCs

- a. *teṽúró teṽuro*    *o=rékéréké*                      *mṽ=dí*                      *á*  
 everyday                      3SG.SET2=be.slow                      3SG.SET1=eat NPM  
 ‘everyday, she eats (them) slowly’ (Rolle & Kari 2016: 147)
- b. *eni*    *e=duw=n*                      *óyi*                      *mé=tá*  
 we    1PL.SET2=follow=FAC                      him/her                      1PL.SET1=go  
 ‘we are going with him’ (Rolle & Kari 2016: 147)

- c. Osoabo **o**=kótú=n                      óyi **mó**=kpéí                      ínúm  
 Osoabo **3SG.SET2**=call=FAC him **3SG.SET1**=tell something  
 ‘Osoabo called (him and is) telling him something.’ (Kari 2004: 113)
- d. Breno **o**=dí=n                      ídíyōm                      **o**=vó                      **mó**=réré                      mú úsuweny  
 Breno **3SG.SET2**=eat=FAC food **3SG.SET2**=take **3SG.SET1**=walk on road  
 ‘Breno is eating while working’, ‘Breno is eating and walking on the road’ (Kari 2003a: 282)

In contrast, SVCs expressing perfective and perfect aspect or negative polarity use identical set 2 proclitics, while SVCs expressing future tense use identical set 1 proclitics, shown in (16).

(16) Future tense single- and double-marking with set 1 proclitics (Rolle & Kari 2016: 148)

- a. Breno **mó**=dúw                      mé **Ø** tá  
 Breno **3SG.SET1**=follow me **Ø** go  
 ‘Breno will go with me’
- b. eni **mé**=dúw                      óyi **mé**=tá  
 we **1PL.SET1**=follow him **1PL.SET1**=go  
 ‘we will go with him/her’

In mono-verbal clauses, both imperfective aspect and future tense are marked solely with a set 1 proclitic resulting in surface ambiguity between these tense/aspect distinctions.

Given these facts about non-identical proclitics largely conditioned by distinct tense/aspect environments, it would be plausible to assume that each verb in the SVC has a distinct Asp<sup>o</sup> projection, which can differentially condition the distinct proclitics.

(17) Asp-Serialization alternative with two Asp heads (Not adopted)

[<sub>Asp-1 P</sub> ... [<sub>v-1 P</sub> ... [<sub>V-1 P</sub> ... [<sub>Asp-2 P</sub> ... [<sub>v-2 P</sub> ... [<sub>V-2 P</sub> ... ] ] ] ] ] ...

Despite this plausibility, I do not adopt this position. If there were two distinct Asp projections, we predict that the micro-events expressed by each verb could bear distinct aspectual values, e.g. ‘he ate (then) and is coming (now)’. There is little if any evidence for this. For example, in (15) the [set 2=...set 1=...] structure together express imperfective aspect idiomatically, and cannot be decomposed into two independent aspect values whose sum expresses imperfective types habitual or present continuous. For those examples which do exist which are translated with multiple aspectual value (e.g. (15)c.), they can easily be interpreted as a single imperfective aspectual value. Further, no instances of mixed enclitics occur (i.e. V<sub>1</sub> with =*īn* FAC and V<sub>2</sub> with =*te* PRF), which are the primary exponents of aspect. I assume that when the syntactic features expressing imperfective aspect appear in a SVC, these features are split across the verbs and result in the distinct exponents on the two verbs (set 2 and set 1 respectively). The exact mechanisms which derive this structure fall outside of the scope of this paper.

### 3.5. Summary of distribution

A summary of the complementary distribution of single-marking and double-marking is provided in Table 4.

V <sub>1</sub> ____ V <sub>2</sub>	Double-marking	Single-marking
Ø	?~* cl=[V <sub>1</sub> ]=cl cl=[V <sub>2</sub> ]=cl	✓ cl=[V <sub>1</sub> V <sub>2</sub> ]=cl
Pron <sub>σ</sub>	?~* cl=[V <sub>1</sub> D <sub>σ</sub> ]=cl cl=[V <sub>2</sub> ]=cl	✓ cl=[V <sub>1</sub> D <sub>σ</sub> V <sub>2</sub> ]=cl
Pron <sub>σσ</sub>	✓ cl=[V <sub>1</sub> ]=cl D <sub>σσ</sub> cl=[V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> D <sub>σσ</sub> V <sub>2</sub> ]=cl
DP	✓ cl=[V <sub>1</sub> ]=cl <b>DP</b> cl=[V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> <b>DP</b> V <sub>2</sub> ]=cl

Table 4: Complementary distribution of clitic marking in SVCs

## 4. DM analysis: A first pass

### 4.1. The need for postsyntactic morphological operations

The distribution of clitics in Degema SVCs can be summarized as a list of licit and illicit structures, shown in Table 5. We require our model to generate only the licit structures and none of the illicit structures.

Licit structures	Illicit structures		
✓ cl=[V]=cl	* cl=[V] $\emptyset$	* $\emptyset$ [V]=cl	* $\emptyset$ [V] $\emptyset$
✓ cl=[V D <sub>σ</sub> ]=cl	* cl=[V D <sub>σ</sub> ] $\emptyset$	* $\emptyset$ [V D <sub>σ</sub> ]=cl	* $\emptyset$ [V D <sub>σ</sub> ] $\emptyset$
✓ cl=[V <sub>1</sub> V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> V <sub>2</sub> ] $\emptyset$	* $\emptyset$ [V <sub>1</sub> V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> ]=cl $\emptyset$ [V <sub>2</sub> ] $\emptyset$
✓ cl=[V <sub>1</sub> D <sub>σ</sub> V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> D <sub>σ</sub> V <sub>2</sub> ] $\emptyset$	* $\emptyset$ [V <sub>1</sub> D <sub>σ</sub> V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> D <sub>σ</sub> ] $\emptyset$ cl=[V <sub>2</sub> ]=cl
✓ cl=[V <sub>1</sub> ]=cl D <sub>σσ</sub> cl=[V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> ] $\emptyset$ D <sub>σσ</sub> cl=[V <sub>2</sub> ]=cl	* cl=[V <sub>1</sub> ]=cl D <sub>σσ</sub> $\emptyset$ [V <sub>2</sub> ]=cl	* etc.

Table 5: Licit and illicit SVC clitic patterns

The central generalization is that all verbs in the licit structures appear in a verbal constituent which is marked by a proclitic and an enclitic, i.e. CL=[V ]=CL (note that enclitics are present only when the morphosyntactic features which they expone are present, i.e. factative and perfect but not future). In comparison, all verbs in the illicit structures appear in a constituent which is not fully marked by these inflectional clitics. We can understand this structure as adhering to a **morphological well-formedness condition**, formalized as a markedness constraint V=WF(INFL) which states that verbs must appear with appropriate inflection. Informally speaking, if the verbs are sufficiently local defined prosodically, they may form a constituent to ‘share’ the clitic marking resulting in single-marking. If however they are not sufficiently local, each verb receives its own set resulting in double-marking.<sup>10</sup>

As stated above, syntax alone is insufficient to account for these patterns as it would require non-standard sensitivity to phonological information, among other shortcomings. Given that syntax is insufficient, we require additional post-syntactic operations to generate the Degema system. The previous section adopted a structure for Degema SVCs Asp > v<sub>1</sub> > V<sub>1</sub> > v<sub>2</sub> > V<sub>2</sub>, where a functional field (including at the very least an aspect projection) is above two vPs in serial. One required post-syntactic operation is the insertion of subject agreement AGR nodes not present in the syntax, expounded as the proclitics. Second, the aspectual enclitics expounding the functional Asp° head is moved to the verb where it right-attaches. Third, if there is an intervening prosodically heavy object the aspectual enclitic is both lowered onto V<sub>1</sub> and copied onto V<sub>2</sub>. Fourth, the fact that adjacent verbs or verbs whose intervening object is prosodically light appear with single marking suggests that they form a constituent at some level of representation (later supported by evidence from grammatical tone). If we accept that these verbs do not form a constituent in the syntax (i.e. no v<sub>1</sub>-to-v<sub>2</sub> syntactic head movement), then constituent formation must take place via a post-syntactic operation, i.e. (V<sub>1</sub>) (V<sub>2</sub>) > (V<sub>1</sub>+V<sub>2</sub>). Two DM operations can fulfil these functions: **dissociated node insertion (DNI)** and **local dislocation (LD)**, which I lay out in the next sections.

We can now ask the following: how does the morphological well-formedness condition V=WF(INFL) relate to the post-syntactic operations? I understand these operations as together constituting a **morphological conspiracy** in the sense that outputs of these operations contribute to surface verbs/verb complexes that converge on a structure CL=[V ]=CL, the generalized licit structure in Table 5. The operations below involve distinct inputs and outputs, but are unified in reducing surface markedness.

(18) Morphological conspiracy and constraint V=WF(INFL)

- a. Lowering of aspectual enclitic to V<sub>1</sub> (via LD)
- b. Constituency formation of sufficiently local verbs (via LD)
- c. Insertion of subject agreement AGR nodes (via DNI)
- d. Copying of aspectual enclitic to V<sub>2</sub> (via DNI)

In this way, the post-syntactic operations are motivated in a way which they would not be in strictly serialist models of DM.<sup>11</sup>

<sup>10</sup> This constraint is characteristic of morphological well-formedness conditions as discussed in the literature, e.g. Halle & Marantz’ (1993:137) account of English tense morphology requiring a verb for well-formedness.

<sup>11</sup> A reviewer questions whether the Degema data actually constitute a conspiracy in the original sense. There are two aspects which define is as conspiratorial. First, the same goal (marking the verb with inflection) is achieved by distinct strategies, lowering of aspect onto V<sub>1</sub> but copying of aspect onto V<sub>2</sub>. The second involves the formation of a verb compound with sufficiently local verbs. While the output in and of itself does not satisfy the constraint (V<sub>1</sub>V<sub>2</sub> constituency by itself does not provide inflectional marking), it can be understood as motivated by the same constraint. By V<sub>2</sub> incorporating, it is able to be marked by appropriate clitics by sharing them with V<sub>1</sub>, and in this is another strategy to achieve surface well-formedness. However, even if the Degema data do not reach the threshold for what is considering a conspiracy, the OT-DM analysis can stand independently. In this context, it should be

Regardless of whether one operationalizes post-syntactic morphology as fully derivational (as in standard DM), semi-derivational (e.g. Rules & Constraints DM), or non-derivational (OT-DM), one theoretical aspect of these data is consistent: any notion of ‘wordhood’ depends on a combination of syntactic, morphological, and phonological factors. In what follows, I will show that morphological wordhood emerges based on requirements of the (OT) grammar, the morphological and phonological properties of vocabulary items (VIs) exponing terminal heads, and surface string adjacency. Neither morphological nor phonological constituency (such as wordhood) is isomorphic to syntactic constituency, which any adequate model of the interface must capture. As pointed out by a reviewer, Degema thus adds to the large body of identified cases which warrant such a model, e.g. the distinct interface behavior of prosodically light versus heavy adpositions in Latin (Embick 2007b, a.o.) and in Hungarian (Trommer 2008) which appear similar to Degema conditions, among many others.

#### 4.2. Dissociated Node Insertion (DNI)

Embick & Noyer (2007: 305-310) discuss the insertion of dissociated material at spellout, which they understand as two types: dissociated feature insertion and dissociated node insertion (i.e. bundles of features on a separate morphological node). For the purposes of this paper, I treat them together and refer to them as **dissociated node insertion (DNI)**. DNI is used to capture what Embick & Noyer call ‘ornamental morphology’, exemplified with Latin thematic vowels and agreement morphemes (glossed TH and AGR, in bold). Such ornamental morphology is inserted post-syntactically and therefore does not expone syntactic terminal nodes.

(19) Latin insertion of ornamental morphology

laud-**ā**-bā-**mus**  
 root-**TH**-TNS-**AGR**  
 ‘We were praising’

DNI of agreement morphology relies on a concept of **feature copying** where a feature “present on a node *X* in the narrow syntax is copied onto another node *Y* at PF” (Embick & Noyer 2007: 309). The exact mechanisms which underlie the agreement patterns are outside of the scope of this paper however, and post-syntactic insertion of morphological nodes is well-supported in the DM/Minimalist literature (Embick & Noyer 2007, Kramer 2010, Norris 2014, a.o.).

With respect to the Degema data, subject agreement proclitics and the second aspectual enclitic on V2 are inserted via DNI, resulting in structures which comply with the V=WF(INFL) constraint. These proclitics appearing in both single- and double-marking are the exponents of feature bundles which are copies of subject PHI-features. Example (20) below repeats ex. (9)a above, involving third person singular proper name subject *Tatane* and the verbs *kotu* ‘call’ and *kperi* ‘tell’. DNI also accounts for the presence of a second aspect marker in the double-marking pattern. In this pattern, the first aspectual enclitic on V1 is the exponent of the syntactic Asp° head while the second enclitic on V2 is a dissociated aspectual agreement node. Both of these share the same features and consequently are both expone by the same vocabulary items. In the example, agreement nodes inserted via DNI are in bold.

(20) DNI of subject agreement in Degema

a. Input:	$[_{AspP}$	$Subject_i$	$[ Asp^\circ$	$[_{v1P}$	<b>Subject<sub>i</sub></b>	$[ v_1^\circ + V_1^\circ$	...	$[ v_2^\circ + V_2^\circ$	...
	Tatane	PRF				$v_1^\circ + \sqrt{KOTU}$	...	$v_2^\circ + \sqrt{KPERI}$	
b. Output:	/Subject/	/PRF/		/AGR <sub>SBJ</sub> /+ /Verb <sub>1</sub> /		/AGR <sub>SBJ</sub> /+ /Verb <sub>2</sub> /+ /AGR <sub>ASP</sub> /			
	/Tatane/	/=te/		/o= /+ /kotu/		/q= /+ /kperi /+ /=te/			

This aspectual concord is directly parallel with Kramer’s (2010) analysis of Amharic definiteness marking. In (21) below, Kramer argues that the first instance of the definite marker *-u* is the exponent of D° (and appears right-adjacent via local dislocation), whereas the second *-u* is the exponent of a post-syntactic Agr node insertion valued through copy featuring (this latter exponent being optional).

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mentioned that Embick (2010:20-21) argues against conspiracies as a whole needing to be captured by the interface model – what he calls the fear a “Putative Loss of Generalization” – and argues they instead should be attributed to grammar-external factors (see also discussion in Haugen 2011:10-13).

(21) Amharic definiteness concord – Dissociated Node Insertion of DEF node

tillik'-u t'ik'ur(-u) bet  
 big-DEF black(-DEF) house  
 'the big black house' (Kramer 2010: 229)

In both the Amharic and Degema cases, surface identical morphemes correspond to features which originate in distinct modules in the derivation.

#### 4.3. Local Dislocation (LD)

The DM operation local dislocation (LD) takes two linearly adjacent constituents  $(\alpha)*(\beta)$  and converts them into a single constituent with or without linear changes, i.e.  $(\alpha+\beta) \sim (\beta+\alpha)$  (Embick & Noyer 2001: 561). After LD, morphemes which would otherwise be expected to be independent words on syntactic criteria (i.e. exponents syntactic terminal heads) are converted into having an affixal relationship. Several accounts employ LD to account for the position of clitics, e.g. in (22) the Latin conjunct clitic =*que* local-dislocates and attaches to the right edge of the first word of the second conjunct.

(22) Local dislocation with Latin =*que*

...(que)\*(barbaris)... → ...(barbaris+que)..  
 [barbaris =que equitibus paucis]  
 barbarian.ABL.PL=and cavalry.ABL.PL few.ABL.PL  
 '...and a few barbarian cavalry-men' (Embick 2007b)

LD operates on linear order and is therefore distinct from the DM operation Lowering which is sensitive to hierarchical structure rather than linear order.

LD can account for several effects of the Degema clitic patterns, illustrated in (23). First, in those structures which appear with aspectual enclitics, these enclitics local-dislocate and right-attach to the adjacent verb; as shown above, the enclitics correspond to a higher syntactic  $Asp^{\circ}$  position.<sup>12</sup> Second, as shown in ex. (6) and throughout, prosodically light object pronouns are the only morphemes which intervene between the verb and the enclitic. Here, the light pronoun local-dislocates with the preceding verb, though without any linear order changes. LD takes place here due to the pronoun being prosodically deficient and unable to form a relevant constituent on its own. Third, if two verbs appear surface adjacent they undergo LD and form a single constituent, i.e. a morphological verb compound. Because LD is sensitive to linear rather than hierarchical structure, this captures the fact that any sequence of adjacent verbs undergoes LD, even those in which a syntactic object has been  $\bar{A}$ -moved or is covert (as shown in (13)-(14) above involving *wh*  $\bar{A}$ -movement).

(23) Local dislocation in Degema

a. (/asp/)\*(V/) → (V+asp/) (/n/)\*(som/) → (som+n/) [Ex. (7)a]  
 b. (V/)\*(D<sub>σ</sub>) → (V+D<sub>σ</sub>) (/tul/)\*(wɔ/) → (tul+wɔ/) [Ex. (7)a]  
 c. (V<sub>1</sub>/)\*(V<sub>2</sub>) → (V<sub>1</sub>+V<sub>2</sub>) (/som/)\*(tul/) → (som+tul/) [Ex. (7)b]

If more than one morpheme appears which is applicable, LD takes place iteratively, shown below.

(24) Iterative local dislocation in Degema

a. (/asp/)\*(V/)\*(D<sub>σ</sub>) → (V/+D<sub>σ</sub>/+asp/)  
 (/te/)\*(gidi/)\*(baw/) → (gidi/+baw/+te/) [Ex. (6)c]  
 b. (/asp/)\*(V<sub>1</sub>/)\*(D<sub>σ</sub>)\*(V<sub>2</sub>/) → (V<sub>1</sub>/+D<sub>σ</sub>/+V<sub>2</sub>/+asp/)  
 (/n/)\*(ɖuw/)\*(me/)\*(ta/) → (ɖuw/+me/+ta/+n/) [Ex. (8)b]

LD is therefore used to account for the fact that certain verb clusters and verb+pronoun clusters have the same distribution as single verbs with respect to inflectional morphology, as they each form a morphological constituent. Thus, Degema exhibits two types of local dislocation: prosodically driven LD for (V)\*(D<sub>σ</sub>) sequences, and morphologically driven LD for (V<sub>1</sub>)\*(V<sub>2</sub>) sequences. If a verb can locally dislocate to satisfy this condition, it does

<sup>12</sup> Verb movement of V1 to  $Asp^{\circ}$  is ruled out because this would predict that in SVCs the aspectual enclitic should always appear between V1 and V2, contrary to fact.

so, avoiding the need for unnecessary dissociated node insertion. In this way, the double-marking pattern represents a ‘repair’ when a single-marking pattern is not possible.<sup>13</sup>

#### 4.4. Support for (V<sub>1</sub>+V<sub>2</sub>) morphological constituency: Evidence from tone

Support for the morphological constituency of verb clusters comes from grammatical tone. Degema contrasts /H/ vs. /L/ tone, as well as downstepped /H/s (downstepped Hs are transcribed as [<sup>+</sup>H]), and in orthography with a macron e.g. <ā>). Tone on verbs is predictable from grammatical context, and is not lexically contrastive. In both the factative and the perfect aspect, a grammatical H tone is assigned to the verb, book-ended by a set 2 agreement proclitic with low tone and the aspectual enclitic =*ṽ*n or =*tē*, as in (25)a. The final downstepped H associated with the enclitic only surfaces if it is followed by all high tones (b.), or is at the end of a phonological phrase (c.).

(25) Grammatical all High tone between clitics

- a. m<sub>i</sub>=(**dé**)=n                      ágada  
1SG.SET2=**buy**=FAC    chair  
‘I bought a chair’ (E.E. Kari, p.c.)
- b. Tatane    o=(**kótú**)=té              éni    ɔ=(**kpéri**)=tē              ínúm  
Tatane    3SG.SET2=**call**=PRF    us    3SG.SET2=**tell**=PRF    something  
‘Tatane has called us and told (us) something’ (Kari 2003a: 285)
- c. o=(**kótú**                      **wó**)=ōn  
3SG.SET2=**call**    **you**=FAC  
‘(s)he called you’ (Kari 2004: 276)

Crucially, in the single-marking SVC all verbs and prosodically light object pronouns between the clitics are marked with H tone as well, as in (26). Unlike verbs, objects such as /isen/ [isèn] ([isén] in isolation) in b. and subjects such as Ohoso /óhósò/ in c. fall outside of this grammatical H tone.

(26) Grammatical all High tone marking between clitics in a SVC

- a. Breno o=(**dúw**                      **mé tá**)=ān  
Breno 3SG.SET2=**follow**    **me go**=FAC  
‘Breno went with me’ (Kari 2004: 115)
- b. ɔ=(**tá**                      **dé**)=n    isen  
3SG.SET2=**go**    **buy**=FAC    fish  
‘(s)he went and bought fish’ (Kari 2004: 311)
- c. Ohoso    ɔ=(**tá**                      **dé wó yí**                      **kíyé**)=n    óyi  
Ohoso    3SG.SET2=**go**    **buy take come**    **give**=FAC    her/him  
‘Ohoso went and bought (something) and brought (it) to her/her’ (Kari 2004: 121)

The facts with future tense are similar. This tense/aspect is marked via a set 1 proclitic but no enclitic, and all verbs are marked with grammatical H tone. In the factative and perfect in (25)-(26) above the set 2 proclitic was marked with L tone. In the future tense/aspect below, the set 1 proclitic is marked with H tone with the exception that the proclitic *me*= 1sg.set1 is always marked with /L/ tone.

<sup>13</sup> In the DM literature, LD most commonly occurs with functional material and not two lexical morphemes such as verbs. However, there is precedence for post-syntactic V+V cluster formation from Germanic. Salzmann (2013) demonstrates that with Swiss German verbs which appear with verb phrase complements, the verb phrase complement is by default linearized to the right, unlike DPs which are linearized to the left (p. 91). However, at the surface level, the selecting verb which is morphosyntactically highest appears at the right edge of a verb cluster, the so called 123 → 231 verb cluster change, shown below:

- (i) Verb cluster formation in Swiss German  
...**laatv**<sub>1</sub>... [lav<sub>2</sub>... [gaav<sub>3</sub>... ] → ... [ [lav<sub>2</sub>=gaav<sub>3</sub> ]+**laatv**<sub>1</sub> ]  
das er si la<sub>2</sub>                      ga<sub>3</sub>                      **laat**<sub>1</sub>  
that he her let.PARTICLE go.INF    **let.3SG**  
‘that he lets her go’ (Salzmann 2013: 89)

Salzmann argues that “verb cluster formation + inversion is a late PF-process akin to Local Dislocation” (p. 90), and that to account for the cluster formation via syntactic head-movement would result in a number of problems such as not making the correct predictions regarding cluster impenetrability facts (p. 114).

## (27) Grammatical /H/ tone with future tense/aspect

- a. me=(yí) bána úkpé vivi  
 1SG.SET1=come here year another  
 'I will come here another year/next year' (Kari 2004: 230)
- b. mó=(vón) íva ɓáaw mó=(vó) yókúró  
 3SG.SET1=take two them 3SG.SET1=take leave  
 '(s)he will leave with both of them', '(s)he will take two of them and leave' [ohk\_201708]

Example b. demonstrates that all verbs within the SVC are marked with H tone.

We can contrast the behavior of verbs in SVCs with that of transitive verbs with overt object nouns. Unlike verbs, tone on nouns is contrastive but they are also subject to grammatical tone changes. Nearly half of all Degema nouns surface with a [L<sup>n</sup>H] tone pattern in isolation (~45%), which is the default tone pattern in the language also found on verbs in isolation. Given that this pattern can be predicted from default rules, I analyze such nouns as inherently toneless, i.e. /Ø/. Other nouns show a restricted number of lexical patterns, all of which must contain at least one lexical /H/ tone. Data in (28)a-b demonstrate that in a SVC where the last verb is three syllables long e.g. *yókuro* 'leave', the /H/ tone spreads across it to the end of the domain, resulting in a consistent all H pattern across the SVC. In contrast, the data in c. show that when the SVC is followed by a three syllable toneless noun /*ágada*/ 'chair', the /H/ tone does not spread to the end. The noun surfaces as [áǵàdà], with a /H/ assigned to the initial syllable of the object.<sup>14</sup>

## (28) Tonal differences in future tense/aspect: Verbs vs. objects

- a. Tense/aspect H tone spread across toneless constituent (V<sub>1</sub>+V<sub>2</sub>+V<sub>3</sub>)  
 mó=(vón) vó yókúró [... jókóró] (cf. \*...yókuro \*[jókòrò])  
 3SG.SET1=take take leave  
 '(s)he will take (it) and leave', '(s)he will leave with (it)' [ohk\_201708]
- b. Tense/aspect H tone spread across toneless constituent (V<sub>1</sub>+O<sub>σ</sub>+V<sub>2</sub>)  
 Bréno mó=(dúw) mé yókúró [... jókóró] (cf. \*...yókuro \*[jókòrò])  
 Breno 3SG.SET1=follow me leave  
 'Breno will leave with me' [ohk\_201708]
- c. Tense/aspect H tone spread across toneless constituent (V<sub>1</sub>+V<sub>2</sub>) to exclusion of following toneless (O)  
 Bréno mó=(tá) gēn) (áǵada) [... áǵàdà] (cf. \*...áǵadá \*[áǵadá])  
 Breno 3SG.SET1=go look.at chair  
 'Breno will look at a chair' [ohk\_201708]

Finally, negation is expressed via a /H/ tone on a type 2 proclitic and an all /L/ pattern on the verb. No aspectual enclitics occur and the distinction between perfective, perfect, imperfective, and future is collapsed.

## (29) Grammatical /L/ tone expressing negation

<sup>14</sup> There is a complication with the assignment of verbal grammatical tone: when the last verb appears with a two-syllable toneless object and this object appears last in the phonological phrase, the second verb is downstepped, shown below in (i.). This is unexpected given that no downstepped H is present when an object is not present (as in (28)a. above), and because the downstepped H appears between the verbs. [The superscript <sup>x</sup> here indicates not attested.]

- (i.) mó=(tá) gēn) énam [mó tá <sup>x</sup>gēn énam] (Cf. <sup>x</sup>[mó tá gēn énam] <sup>x</sup>[mó tá gēn <sup>x</sup>énam])  
 3SG.SET1=go look.at animal <sup>x</sup>[mó <sup>x</sup>tá gēn énam])  
 '(s)he will go look at an animal' [ohk\_201708]

As mentioned, downstepped Hs only surfaces if they appear following all high tones or they are at the end of a phonological phrase.

A partial answer to this unexpected data point involves restrictions in the tonal grammar of Degema. Of a corpus of Degema nouns from Kari's (2008) dictionary, there are downstepped surface patterns [H<sup>+</sup>H], [H<sup>+</sup>HH], [H<sup>+</sup>HHH], [LH<sup>+</sup>H], [LHH<sup>+</sup>H], [LH<sup>+</sup>HH], [HLH<sup>+</sup>H], and [LLH<sup>+</sup>H], but there are no patterns <sup>x</sup>[(L)HH<sup>+</sup>HH] where the word has two H tones followed by a downstepped H-H sequence. I therefore suspect that phonological markedness constraints affect the distribution of grammatical H tone with future tense/aspect. Why this affects (i.) but not (28)a. requires further examination.



- a. mée mǐ=tá=an                      ɔ̌ mée mǐ=(**mon**)                      óyi                      [...mǐ **m̀n** ǒjì]  
 I                      1SG.SET2=go=FAC                      but I                      NEG\1SG.SET2=**see**                      her/him  
 'I went but I didn't see her/him' (Kari 2004: 138)
- b. mǐ=(**seneke**)                      mú ívom  
 NEG\1SG.SET2=**think**                      in                      inside  
 'I don't think so' (Kari 2004: 32)

As with grammatical tone above, the /L/ tone spreads across the entire SVC constituent.

(30)

- a. ɔsamá yɔ                      ǒ=(**buw**                      **kel**                      **me**)                      [...ǒ bòw kèl mè]  
 shirt the                      NEG\3SG.SET2=**be.big**                      **be.more.than**                      **me**  
 'the shirt is not bigger than me' [i.e. not oversized] (Kari 2004: 155)
- b. ǒ=(**ɔ̌eri**                      **me**) kábuló                      ǒ=(**meme**                      **ɔ̌i**) ídíyóm yɔ  
 NEG\3SG.SET2=**know**                      **me**                      because                      NEG\3SG=**agree**                      **eat**                      food the  
 '(s)he refused to eat the food because (s)he doesn't know me' (Kari 2004: 45)
- c. Ohoso ǒ=(**kotu**                      **me** **kake**)                      inum  
 Ohoso NEG\3SG.SET2=**call**                      **me**                      **show**                      something  
 'Ohoso did not call me and (did not) show (me) something' (Kari 2003a: 278)

Parallel to the examples in (28), if the negative SVC is followed by a three-syllable toneless object, for some speakers the noun bears an initial /H/ tone (a.). For other speakers, inherently toneless objects remain toneless under negation regardless of syllable count and bear all /L/ tones on the surface b. (the % indicates inter-speaker variability).

(31)

- a. %Breno                      ǒ=(meme                      mene)                      **úmene**  
 Breno                      NEG\3SG.SET2=agree do                      **work**  
 'Breno refused to work' (Kari 2004: 117)
- b. %Breno                      ǒ=(meme                      mene)                      **umene**                      [ohk\_201708]

In contrast, when the verbs in the SVC are separated by a prosodically heavy object resulting in double-marking, for all speakers only V1 bears negation tone and does not spread across the intervening object, shown below. Any subsequent verbs are marked with /H/ tone and a set 2 proclitic bearing /L/ tone (no enclitics occur here, as well). Although negation tone is marked on only V1, negation takes scope over both verbs (scope relations explicitly noted in Kari 2004: 111).

(32)

- a. Ohoso                      ǒ=(**kotu**)                      éni                      ɔ̌=(**káké**)                      ínúm  
 Ohoso                      NEG\3SG.SET2=**call**                      us                      3SG.SET2=**show**                      something  
 'Ohoso did not call us and show (us) something' (Kari 2003a: 279)
- b. Osoabo                      ǒ=(**von**)                      élege                      ɔ̌=(**fiyá**)  
 Osoabo                      NEG\3SG.SET2=**take**                      knife                      3SG.SET2=**cut**  
 'Osoabo did not use a knife to cut something' (Kari 2004: 111)  
 (*Not* 'Osoabo cut something but didn't use a knife (to do it)')
- c. Cf. Ungrammatical 'doubling' of negation tone  
 \*Osoabo                      ǒ=(**von**)                      élege                      ǒ=(**fiya**)

This example illustrates that V2 can only bear grammatical tone expressing negation only when it is sufficiently local to V1, which supports morphophonological constituency of these verbal sequences.<sup>15</sup>

<sup>15</sup> Another set of complications for grammatical tone and morphological constituency comes from Degema auxiliaries. Auxiliary verbs are a closed class with 12 members which appear between the subject and first lexical verb. They consist of *nwanyi* 'intended to', *manyi*(*ma*) 'shouldn't', *ma<sub>1</sub>* 'would have', *ku* 'did' (verum focus), *buka*(*ma*) 'begin', *ma<sub>2</sub>* 'not yet', *da<sub>1</sub>* 'then', *si<sub>1</sub>* 'had finished', *kiri/kuru* 'again, also', *da<sub>2</sub>* 'about to', *si<sub>2</sub>/su* 'still', and *ga* 'actually'. Generally speaking, auxiliary constructions show properties which can be subsumed under serial verb

#### 4.5. Problems with Rules & Constraint DM

The DM operations Dissociated Node Insertion (DNI) and Local Dislocation (LD) have been invoked to account for morphological adjustments necessary to comply with the morphological markedness constraint V=WF(INFL). In sections 2.3-2.4, we contrasted two fundamentally different DM sub-theories: Rules & Constraints DM (R&C DM) and Optimality Theoretic DM (OT-DM). In this section, I discuss an analysis of the Degema data within R&C DM and show why this is inadequate for capturing the facts.

Under the R&C DM approach, DM operations are rules which are ordered and apply in serial. If we call such a rule computation  $K$  following Embick (2010), then the grammar will “apply computation  $K$  when the structural description of  $K$  is met” (p. 40 – see also the principle of ‘Rules Apply’ in Bobaljik 2017). Under R&C DM, constraints exist as inviolable filters which can trigger a rule to repair illicit structures, e.g. the constraint T-NONINITIALITY in Basque triggering a number of repairs discussed in section 2.3. Extended to Degema, we would state that the operations DNI and LD are repairs to satisfy an analogous filter.

There are two main arguments against this view. First, a conceptual one is the **duplication** argument, common in debates of rules versus constraints. This states that if constraints are necessary and if constraints can derive the patterns that rules can, then rules only serve to duplicate constraint mechanics and are therefore superfluous. Second, an argument specific to the Degema data involves the inadequacy of rule ordering in accounting for the data. As most work in DM is rule/R&C based, it is critical to establish the order of operations. It is frequently claimed or assumed that feature copying/dissociated node insertion takes place before vocabulary insertion (VI), which takes place before local dislocation (Embick & Noyer 2001, 2007; Embick 2007b). The common evidence justifying this ordering involves bleeding and feeding relations, e.g. in the Latin example in (22) above the phonological properties of the VIs involved will affect the LD pattern involving the enclitic =*que* (e.g. the prosodic weight of prepositions).

(33) Embick & Noyer (2001) - DM order of operations

DNI > VI > LD

This order of operations predicts the wrong patterns in Degema. Both the single-marking and the double-marking SVC patterns derive from the same syntactic structure, and therefore the only difference in their post-syntactic inputs is the absence vs. presence of an overt intervening DP object. This is shown in the tables below using the double-marking context  $mi=\acute{d}uw=n \acute{o}yi \acute{m}i=ta=\acute{a}n$  ‘I went with her/him’ (from (8) above), versus the single-marking  $Ohoso \acute{o}=ta \emptyset \acute{d}e=n isen$  ‘Ohoso went and bought fish’ with no intervening object (from (11) above). Table 6 illustrates that the standard rule order would correctly predict the attested surface form.

Syntax	$[_{ASP} ASP^{\circ} [_{v1P} v1^{\circ}+V1^{\circ} [ DP \forall_1^{\circ} [_{v2P} v2^{\circ}+V2^{\circ} [ \forall_2^{\circ} ] ] ] ] ] ]$
DNI	$(asp^{\circ}) (agr_{sbj}+v1^{\circ}+V1^{\circ}) (DP) (agr_{sbj}+v2^{\circ}+V2^{\circ}+agr_{asp})$
VI	$(n)^*(mi+\acute{d}uw)^*(\acute{o}yi)^*(\acute{m}i+ta+n)$
LD	$(mi+\acute{d}uw+n)^*(\acute{o}yi)^*(\acute{m}i+ta+n)$
Predicted:	$mi=\acute{d}uw=n \acute{o}yi \acute{m}i=ta=n$ ☹ Attested: $mi=\acute{d}uw=n \acute{o}yi \acute{m}i=ta=n$

Table 6: Correct prediction in double-marking context with intervening DP object

In contrast, the single-marking table illustrates that this rule order would not correctly predict the attested surface form. Here, because DNI applies first, both sets of clitics receive full agreement marking. This is then the input for VI which inserts proclitics and enclitics on both sets of verbs, followed by LD which dislocates the initial enclitic. The result would be an incorrect form  $^* \acute{o}=ta=n \acute{o}=\acute{d}e=n$  (tone not marked).

constructions with respect to the distribution of clitics. If an auxiliary and verb are surface adjacent, then the proclitic falls only on the auxiliary (with the exception of obligatory double-marking expressing imperfective aspect, example (15) on p. 10).

However, the first four auxiliaries listed above  $nw\acute{a}nyki$ ,  $m\acute{a}nyki(ma)$ ,  $m\acute{a}_1$ , and  $k\acute{u}$  have unexpected tonal effects which I do not account for at present. For example,  $\acute{m}i=\acute{m}\acute{a}_1 \acute{d}uw w\acute{o} \acute{t}\acute{a}$  ‘I would’ve followed you (but didn’t)’ with auxiliary  $m\acute{a}_1$  ‘would have’ appears with a SVC and together bear a [HLH] tonal melody. I adopt a working hypothesis that auxiliaries are subject to the same grammar as SVCs involving local dislocation and dissociated node insertion, but trigger distinct tonal melodies compared to lexical verbs. Discussion of Degema auxiliaries is found on: Kari (2003b:40-50,121,170,209), Kari (2004:25,30,35-38,68,77,132,160-163,234,278,284-291,295,302,347), and Kari (2005b).



than other constraints. Markedness constraints are counterweighted by mapping constraints which enforce particular mappings between input and output structure, and other faithfulness and markedness constraints. This is schematized in Tableau 1 below, involving the three main input types: SVCs with no object /  $V_1 V_2$  /, SVCs with a prosodically light object /  $V_1 D_\sigma V_2$  /, and SVCs with a prosodically heavy object /  $V_1 D_{\sigma\sigma} V_2$  /. These inputs all have the potential to map to verbal structures without any clitic marking ('None'), structures with single-marking ('Single'), and structures with double-marking ('Double').




I:	/ $V_1 V_2$ /		Mark Set 1	Map Set 1	Faith	Map Set 2
O <sub>1</sub> :	None	$V_1 V_2$	1 !			
O <sub>2</sub> :	 Single	$cl=[V_1 V_2]=cl$			1	4
O <sub>3</sub> :	Double	$cl=[V_1]=cl cl=[V_2]=cl$			3 !	2
I:	/ $V_1 D_\sigma V_2$ /		Mark Set 1	Map Set 1	Faith	Map Set 2
O <sub>1</sub> :	None	$V_1 D_\sigma V_2$	1 !			
O <sub>2</sub> :	 Single	$cl=[V_1 D_\sigma V_2]=cl$			1	6
O <sub>3</sub> :	Double	$cl=[V_1 D_\sigma]=cl cl=[V_2]=cl$			3 !	4
I:	/ $V_1 D_{\sigma\sigma} V_2$ /		Mark Set 1	Map Set 1	Faith	Map Set 2
O <sub>1</sub> :	None	$V_1 D_{\sigma\sigma} V_2$	1 !			
O <sub>2</sub> :	Single 1	$cl=[V_1 D_{\sigma\sigma} V_2]=cl$	1 !		1	6
O <sub>3</sub> :	Single 2	$cl=[V_1 V_2]=cl D_{\sigma\sigma}$		2 !	1	4
O <sub>4</sub> :	 Double	$cl=[V_1]=cl D_{\sigma\sigma} cl=[V_2]=cl$			3	2

Tableau 1: Emergence of single and double-marking patterns (numbers = number of violations)

The no clitic marking pattern for all inputs is eliminated because it violates the highly ranked markedness constraint. Single-marking surfaces in the /  $V_1 V_2$  / and /  $V_1 D_\sigma V_2$  / contexts over double-marking. Here, neither the single-marking or double-marking candidate violates the highly ranked markedness or mapping constraints – Mark Set 1 and Map Set 1 – but the double-marking candidate incurs more violations of the Faith set than the single-marking candidate and is thus eliminated. In contrast, double-marking in the /  $V_1 D_{\sigma\sigma} V_2$  / context surfaces over two potential single-marking outputs:  $cl=[V_1 D_{\sigma\sigma} V_2]=cl$  with pronoun integration and  $cl=[V_1 V_2]=cl D_{\sigma\sigma}$  with V dislocation over the pronoun (note that backslashes \ are used to indicate the output, analogous to // for inputs). The first single-making candidate incurs a fatal violation of a constraint in Marked Set 1 and is thus eliminated, while the second single-marking candidate incurs a fatal violation from Map Set 1. For all derivations, the single-marking candidates have more violations of Map 2 constraints than the double-marking, but because Map 2 constraints are dominated they are rendered inert. In what follows, these constraint sets are fully expanded and defined.

Non-formally, single-marking is preferred overall as it consists of the least number of clitics. However, if single-marking is too costly then double-marking results as a secondary 'repair', ensuring verbs are marked with appropriate inflection. I formalize and exemplify this central insight below. See also Appendix 2, where I illustrate a factorial typology using the proposed constraint set.

### 5.1. The constraint set

The constraint set I adopt is in Table 10 below. These are split into three constraint-strata (C-Strata) separated by solid lines, within which are sets of constraints separated by a dotted line. C-Strata are crucially ordered and must appear in the order provided. The constraints within each C-Stratum are not crucially ordered, but grouped together based on their type. There are four different types of constraints. Faithfulness (Faith) and mapping (Map) constraints are evaluated by comparing the input structure to an output candidate. Markedness (Mark) and alignment (Align) constraints solely evaluate output candidates, without reference to the input.

Within C-Stratum 1, the first constraint set Mark 1 is composed of a series of markedness constraints 1-7. Constraints 1-3  $V=WF\_MWD(AGR_{SB})$ ,  $V=WF\_MWD(asp)$ , and  $V1>V2$  enforce inflection on morphological words. Constraint 4  $MWD=PRWD$  enforces the morphological word to be a well-formed prosodic word, ensuring that clitics are incorporated into a surrounding word. Constraints 5-7 are **Labeling Constraints**, which this paper introduces. Labeling constraints require that all morphological words be labeled with a category reflecting a prosodically strong morpheme within that morphological word. For example, a syntactic verbal head which corresponds to a vocabulary item /V/ within a morphological word is labeled with {V}, as shown below.

(35)

- a.  $x^\circ \leftrightarrow (/x/)_\{x\}$
- b.  $v^\circ+V^\circ \leftrightarrow (/V/)_\{V\}$
- c.  $D^\circ \leftrightarrow (/D/)_\{D\}$

The labeling constraint \*COMPLEXMWD<sub>{LABEL}</sub> prohibits having more than one morphological label on a single MWd, and {V}>{D} prefers to have a label {V} over {D} when they are in competition. These will become important when we look at SVCs with objects.

Within C-Stratum 1, constraints 8-9 ALIGN-/agr<sub>sbj</sub>/-L and ALIGN-/asp/-R are Align constraints and enforce alignment between the edge of a clitic and the edge of a morphological word. Constraint 10 LINEARITYMAP-IO:LEX is a mapping constraint, which evaluates the interface mapping between syntactic hierarchical structure (the input) and morphological structure (the output). This constraint evaluates whether the hierarchical order of lexical constituents in the input is reflected in the linear order of counterparts in the output, and can be parameterized for specific grammars or sub-grammars. For example, in Degema the transitive verb structure [  $v^\circ+V^\circ$  [ DP ] ... ] is always mapped to a linear order /V D/ (head-initial order). This constraint can be more technically defined based on specific properties of syntactic heads and VIs. Issues of linearization fall outside of the scope of this paper, and for our purposes we will assume that this constraint gives us a baseline expectation for syntax-to-morphology mapping.

Within C-Stratum 2, Faith and Mark 2 constraints counterweight the Mark 1 constraints in C-Stratum 1. Faith constraint 11 DEP-IO(NODE) penalizes the insertion of dissociated nodes such as subject and aspect agreement. Markedness constraints 12-13 assign a violation for every occurrence of subject or aspect agreement.

Finally, C-Stratum 3 contains two Map constraints. Constraint 14 MAP(WD\_TYPE) states that a syntactic head  $x^\circ$  which is not dominated by a head  $x^\circ$  is mapped to a morphological word (MWd) (see Embick & Noyer 2001:574).<sup>16</sup> By default syntactic words should correspond to morphological words, e.g. both functional and lexical heads correspondence to MWds. Finally, constraint 15 LINEARITYMAP-IO:FNC limits manipulating the expected linear order of functional head exponents, e.g. the linear position of aspect with respect to lexical items.

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<sup>16</sup> Embick & Noyer's (2001: 574) definition: "at the input to Morphology, a node  $X^\circ$  is (by definition) a *morphosyntactic word* (MWd) iff  $X^\circ$  is the highest segment of an  $X^\circ$  not contained in another  $X^\circ$ ".

Set	#	Constraint	Definition	Function
<b>Mark 1</b>	1	V=WF_MWD(AGR <sub>SBJ</sub> )	For a MWd marked with label {Verb} ({V}), assign a violation if it is not marked with subject agreement	Verbal words have a proclitic
	2	V=WF_MWD(ASP)	For a MWd marked with label {Verb} ({V}), assign a violation if it is not marked with aspect	Verbal words have an enclitic
	3	V1>V2	Under competition, the first MWd marked with label {Verb} ({V}) (defined linearly) bears inflection over the second MWd marked {V}	Mark the first verb with inflection over the second when you can't mark both
	4	MWD=PRWD	A morphological word is a well-formed prosodic word	Clitics and light object pronouns incorporate into a surrounding word
	5	MWD <sub>{LABEL}</sub>	For a MWd, assign a violation if a prosodically strong morpheme of category M does not project a morphological label {M}	Words containing a verb are labeled {V}, prosodically strong pronouns/nouns as {D}, etc.
	6	*COMPLEXMWD <sub>{LABEL}</sub>	For a MWd, assign a violation if it is marked with more than one morphological label	Words with more than one lexical item are not labeled with both, i.e. *{V},{D}
	7	{V}>{D}	Under competition, a MWd should be marked with label {Verb} ({V}) over a label {D}	Mark words with a verb with a {V} label over a {D} label when you can't have both
<b>Align</b>	8	ALIGN-/AGR <sub>SBJ</sub> /-L	The left edge of an /agr <sub>sbj</sub> / morpheme coincides with the left edge of a MWd	Agreement proclitics appear first in the word
	9	ALIGN-/ASP/-R	The right edge of an /asp/ morpheme coincides with the right edge of a MWd	Aspect enclitics appear last in the word
<b>Map 1</b>	10	LINEARITYMAP-IO:LEX	The hierarchical order of lexical constituents x° and y° in the input is reflected in the linear order of counterparts /x/ and /y/ in the output	Limits manipulating the expected linear order of lexical exponents (e.g. Vs, Prons, Ns)
<b>Faith</b>	11	DEP-IO(NODE) <sup>17</sup>	Morphemes in the output correspond to syntactic terminal heads in the input	Penalizes the insertion of dissociated nodes (e.g. Agr)
<b>Mark 2</b>	12	*AGR <sub>ASP</sub>	Assign a violation for every instance of aspect agreement	Don't have aspect agreement
	13	*AGR <sub>SBJ</sub>	Assign a violation for every instance of subject agreement	Don't have subject agreement
<b>Map 2</b>	14	MAP(WD_TYPE)	Map a syntactic head x° which is not dominated by a head x° to a morphological word (MWd)	By default, syntactic words should correspond to morphological words
	15	LINEARITYMAP-IO:FNC	The hierarchical order of a functional head x° with respect to any head y° in the input is reflected in the linear order of counterparts /x/ and /y/ in the output	Limits manipulating the expected linear order of functional head exponents (e.g. aspect)

Table 10: Constraint set accounting for Degema clitics patterns (solid lines indicate distinct crucially ordered Constraint-Strata)

<sup>17</sup> Compare Wolf (2015:372) DEP-M(F) which penalizes the insertion of features not present in input.

## 5.2. The candidate set

This above constraint ranking will be used to evaluate a candidate set. Each syntactic input is mapped to a morphological output. The input-output mappings for the distribution of verbal clitics in Degema is provided in Table 11. These recapitulate the distribution of clitics: the single-marking pattern is found when there is no prosodically heavy object, and double-marking is found when there is.

Type	Syntactic Input (SI) to Morphological Output (MO) Mapping	
V	SI	/ [aspP asp° [v1P v1°+V1° [ Ø Ψ4° ] ] ] /
	MO	(/agr_sbj+/V+/asp/){V}
V V	SI	/ [aspP asp° [v1P v1°+V1° [ Ø Ψ4° [v2P v2°+V2° [ Ψ2° ] ] ] ] ] /
	MO	(/agr_sbj+/V1+/V2+/asp/){V}
V D <sub>σ</sub>	SI	/ [aspP asp° [v1P v1°+V1° [ DP Ψ4° ] ] ] /
	MO	(/agr_sbj+/V+/D <sub>σ</sub> +/asp/){V}
V D <sub>σ</sub> V	SI	/ [aspP asp° [v1P v1°+V1° [ DP Ψ4° [v2P v2°+V2° [ Ψ2° ] ] ] ] ] /
	MO	(/agr_sbj+/V1+/D <sub>σ</sub> +/V2+/asp/){V}
V D <sub>σσ</sub>	SI	/ [aspP asp° [v1P v1°+V1° [ DP Ψ4° ] ] ] /
	MO	(/agr_sbj+/V+/asp/){V} * (D <sub>σσ</sub> /){D}
V D <sub>σσ</sub> V	SI	/ [aspP asp° [v1P v1°+V1° [ DP Ψ4° [v2P v2°+V2° [ Ψ2° ] ] ] ] ] /
	MO	(/agr_sbj1+/V1+/asp/){V} * (D <sub>σσ</sub> /){D} * (/agr_sbj2+/V2+/agr_asp2/){V}

Table 11: Input-output mappings at syntax/morphology interface

Any constraint ranking proposed needs to successfully generate these and only these input-output mappings.

In order to assess the success of an OT-DM model, I generated a list of output candidates to be evaluated. These output candidates compete and the most optimal candidate is selected. Output candidates were systematically generated along a series of dimensions.

(36) Dimensions along which output candidates were generated

- IncD:** Did the verb and the pronominal object form one MWd or two?  
i.e. (/V+/D/) vs. (V/)\* (D/)
- IncV:** In SVCs, did the verbs form one MWd or two?  
i.e. (V1+/V2/) vs. (V1/)\* (V2/)
- IncAsp:** Did the aspect marker and the verb form one MWd or two?  
i.e. (/asp+/V/) vs. (/asp/)\* (V/)
- LinAsp:** What is the linear position of the aspect marker?  
i.e. (/asp+/V/) vs. (V+/asp/)
- SbjAgr:** Did the verb appear with subject agreement in the same MWd?  
i.e. (V/) vs. (/agr\_sbj+/V/)
- AspAgr:** Did the verb appear with aspect marking in the same MWd?  
i.e. (V/) vs. (V+/asp/)-(V+/agr\_asp/)
- Label:** Does the label of the MWd reflect a prosodically strong morpheme within it?  
i.e. (/V+/D<sub>σ</sub>/){V} vs. (V+/D<sub>σ</sub>/){D}

Each dimension had a number of values, e.g. IncV was a simple Y/N whereas AspAgr is more complicated in that it was evaluated twice in SVCs, once for each verb (N/YV1/YV2/YBoth). Every value of every dimension was combined to produce a set of candidates. Simplex inputs such as the /V/ type ([aspP asp° [v1P v1°+V1° [ Ø Ψ4° ] ] ]) had fewer output candidates ( $n=14$ ) because not all dimensions or values were relevant. Complex inputs such as /V D<sub>σσ</sub> V/ had many more output candidates ( $n=214$ ).

The first three dimensions IncD, IncV, and IncAsp reflect the presence or absence of one type of change associated with the DM operation Local Dislocation: the conversion of an independent morphological word MWd to a subword (SWd), i.e. a shift in morphological ‘typing’ (see Embick 2007b). For example, separate verbs would constitute an output (V)<sub>MWd</sub> \* (V)<sub>MWd</sub> whereas morphologically-incorporated verbs would be ((V)<sub>SWd</sub> + (V)<sub>SWd</sub>)<sub>MWd</sub>. The fourth dimension LinAsp reflects another aspect of Local Dislocation, namely whether the aspect marker appears in its expected position or appears ‘dislocated’ with respect to a surrounding element (what ‘expected’ refers to is discussed below). The dimensions SbjAgr and AspAgr are equivalent to the DM operation Dissociated Node Insertion.

The generation of competing output candidates makes this OT-DM analysis distinct from DM analyses not implemented in a constraint-based model. In an OT-DM analysis, DM operations LD and DNI are decomposed into constraints which are freely available in all derivations, and are not strictly licensed by a lexical item or a particular grammatical or phonological context. Strictly speaking, all elements within a specific input-output mapping are potentially subject to dislocating or the insertion of morphological nodes. Only those candidates where such changes are optimizing are selected.

### 5.3. The constraint ranking and evaluation

The constraint ranking from Table 10 above is summarized below, dividing constraints into their C-Stratum/type.

(37)	<b>C-Stratum 1</b>	»	<b>C-Stratum 2</b>	»	<b>C-Stratum 3</b>
	<b>Mark 1</b>		<b>Faith/Mark 2</b>		<b>Map 2</b>
	<b>Align/Map 1</b>				
<div style="display: flex; flex-direction: column; gap: 5px;"> <span>V=WF_MWd(agr<sub>sbj</sub>)</span> <span>V=WF_MWd(asp)</span> <span>V1&gt;V2</span> <span>MWd=PrWd</span> <span>MWd<sub>{label}</sub></span> <span>*ComplexMWd<sub>{label}</sub></span> <span>{V}&gt;{D}</span> </div>	<div style="display: flex; flex-direction: column; gap: 5px;"> <span>Align-/agr<sub>sbj</sub>/-L</span> <span>Align-/asp/-R</span> <span>Linearity-IO:Lex-to-Lex</span> </div>	»	<div style="display: flex; flex-direction: column; gap: 5px;"> <span>DEP-IO(Node)</span> <span>*agr<sub>asp</sub></span> <span>*agr<sub>sbj</sub></span> </div>	»	<div style="display: flex; flex-direction: column; gap: 5px;"> <span>Map(Wd_Type)</span> <span>Linearity-IO:Fnc</span> </div>

This constraint ranking was determined using OTSoft v2.5 (Hayes et. al 2013) by providing the program with fully evaluated tableaux for the 6 contexts. I illustrate this constraint ranking in the tableaux below.

The first tableau involves the /V/ input which involves no other verbs and no objects, shown in Tableau 2. The winning output is candidate 1. Candidates 8-14 do not appear with subject agreement /agr<sub>sbj</sub>/ in the MWd containing the verb and therefore incur a fatal violation of V=WF\_MWd(AGR<sub>SBJ</sub>) are eliminated. Similarly, candidate 7 violates V=WF\_MWd(ASP) and is eliminated. In candidate 6, the asp° head is mapped to a VI /asp/ which appears in an expected pre-verbal position. However, because aspect clitics are prosodically deficient, if they appear within their own MWd they violate MWd=PRWD; because candidate 6 violates this it is eliminated. Candidate 5 incorporates /asp/ within the MWd containing the verb and therefore avoids a violation of MWd=PRWD; however this candidate is marked with two morphological labels {V} and {Asp} and therefore violates \*COMPLEXMWd<sub>{LABEL}</sub> and is eliminated. Finally, candidates 2-4 containing MWds which are solely marked with {V} but the /asp/ marker does not appear at the right edge of the MWd, thereby violating ALIGN-/ASP/-R.

The winning candidate is therefore candidate 1  $\backslash(/agr_{sbj}/+/V/+/asp/)\{V}\backslash$  which does not incur any of these violations of constraint stratum (CS) 1 (recall that backslashes  $\backslash\backslash$  indicate output forms). This candidate does incur lower ranking violations in CS 2 and 3, though they are non-fatal as all other candidates have been eliminated. This candidate appears with /agr<sub>sbj</sub>/, violating both DEP-IO(NODE) and \*AGR<sub>SBJ</sub> penalizing the insertion of dissociated nodes not present in the input. Further, this candidate violates mapping constraints MAP(WD\_TYPE) because by default the Asp° head should map to an independent MWd which it does not, and also LINEARITYMAP-IO:FNC because by default the Asp° head should be linearized before the verb.



Input: [aspP asp° [v1P v1°+V1° [Ø Ψ+ ]]]		Constraint stratum (CS) 1										CS 2		CS 3	
		V=WF_MW/D(AGR_SBJ)	V=WF_MW/D(ASP)	V1>V2	MW/D=PRW/D	MW/D{LABEL}	*COMPLEXMW/D{LABEL}	{V}>{D}	ALIGN-/AGR_SBJ/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR_ASP	*AGR_SBJ	MAP(W/D_TYPE)
1	$\mathbb{P}$	(/agr_sbj/+V/+asp/){V}									1		1	1	1
2		(/agr_sbj/+asp/+V/){V}							1 !		1		1	1	
3		(/agr_sbj/+V/+asp/+agr_asp/){V}							1 !		2		1	1	1
4		(/agr_sbj/+asp/+V/+agr_asp/){V}							1 !		2	1	1	1	
5		(/agr_sbj/+V/+asp/){V},{Asp}				1 !					1		1	1	1
6		(/asp/){Asp} * (/agr_sbj/+V/+agr_asp/){V}			1 !						2	1	1		
7		(/asp/){Asp} * (/agr_sbj/+V/){V}	1 !		1						1		1		
8		(/V/+asp/){V}	1 !											1	1
9		(/asp/+V/){V}	1 !						1					1	
10		(/asp/+V/+agr_asp/){V}	1 !						1		1	1		1	
11		(/V/+asp/+agr_asp/){V}	1 !						1		1	1		1	1
12		(/V/+asp/){V},{Asp}	1 !			1								1	1
13		(/asp/){Asp} * (/V/+agr_asp/){V}	1 !		1						1	1			
14		(/asp/){Asp} * (/V/){V}	1 !	1	1										

Tableau 2: /V/ input type

Moreover, Tableau 3 and Tableau 4 illustrate how this constraint ranking accounts for the correct outputs with /V D<sub>σ</sub>/ and /V D<sub>σσ</sub>/ input types. Tableau 3 involving the /V D<sub>σ</sub>/ type is a condensed version of the tableau found in Appendix 1: Evaluation (full tableaux). Output candidates 16-31 do not appear with subject agreement, and candidates 14-15 do not appear marked by aspect, and are therefore eliminated. Constraints 8-13 are eliminated because they violate MWD=PRWD, either because the prosodically deficient aspect VI /asp/ is not incorporated into a surrounding MWd or because the prosodically deficient monosyllabic object pronoun is not incorporated. Candidate 7 (/agr<sub>sbj</sub>/+/V/+/D<sub>σ</sub>/+/asp/)<sub>{V},{D},{Asp}</sub> involves incorporation of both /asp/ and /D<sub>σ</sub>/ but is eliminated because it contains more than one morphological label violating \*COMPLEXMWD<sub>{LABEL}</sub>. Finally candidates 2-6 are eliminated as they contain an aspect marker which is not right-aligned to the MWd. As with the /V/ type above, the winning candidate here violates lower ranked constraints in CS 2 and 3. It incurs two violations of MAP(WD\_TYPE) because both /D<sub>σ</sub>/ and /asp/ do not belong to separate MWds.

		Constraint stratum (CS) 1									CS 2			CS 3		
Input:		V=WF_MWD(AGR <sub>SBJ</sub> )	V=WF_MWD(ASP)	V1>V2	MWD=PrWD	MWD <sub>{LABEL}</sub>	*COMPLEXMWD <sub>{LABEL}</sub>	{V}>{D}	ALIGN-/AGR <sub>SBJ</sub> /-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR <sub>ASP</sub>	*AGR <sub>SBJ</sub>	MAP(WD_TYPE)	LINEARITYMAP-IO:FNC
		[ <sub>asp</sub> asp° [ <sub>v1p</sub> v1°+V1° [ DP Ψ <sub>+</sub> ° ] ] ]														
1		(/agr <sub>sbi</sub> /+/V+/D <sub>σ</sub> /+asp/) <sub>{V}</sub>										1		1	2	2
2		(/agr <sub>sbi</sub> /+/asp+/V+/D <sub>σ</sub> /) <sub>{V}</sub>								1 !		1		1	2	
3		(/agr <sub>sbi</sub> /+/V+/asp+/D <sub>σ</sub> /) <sub>{V}</sub>								1 !		1		1	2	1
4		(/agr <sub>sbi</sub> /+/asp+/V+/D <sub>σ</sub> /+agr <sub>asp</sub> /) <sub>{V}</sub>								1 !		2	1	1	2	
5		(/agr <sub>sbi</sub> /+/V+/asp+/D <sub>σ</sub> /+agr <sub>asp</sub> /) <sub>{V}</sub>								1 !		2	1	1	2	1
6		(/agr <sub>sbi</sub> /+/V+/D <sub>σ</sub> /+asp+/agr <sub>asp</sub> /) <sub>{V}</sub>								1 !		2	1	1	2	2
7		(/agr <sub>sbi</sub> /+/V+/D <sub>σ</sub> /+asp/) <sub>{V},{D},{Asp}</sub>					1 !					1		1	2	2
8		(/agr <sub>sbi</sub> /+/V+/asp/) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub>				1 !						1		1	1	1
9		(asp/) <sub>{Asp}</sub> * (/agr <sub>sbi</sub> /+/V+/D <sub>σ</sub> /+agr <sub>asp</sub> /) <sub>{V}</sub>				1 !						2	1	1	1	
...		[Cand 10-12]				1 !										
13		(asp/) <sub>{Asp}</sub> * (/agr <sub>sbi</sub> /+/V+/agr <sub>asp</sub> /) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub>				2 !						2	1	1		
14		(asp/) <sub>{Asp}</sub> * (/agr <sub>sbi</sub> /+/V+/D <sub>σ</sub> /) <sub>{V}</sub>		1 !		1						1		1	1	
15		(asp/) <sub>{Asp}</sub> * (/agr <sub>sbi</sub> /+/V/) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub>		1 !		2						1		1		
16		(V+/D <sub>σ</sub> /+asp/) <sub>{V}</sub>	1 !												2	2
...		[Cand 17-30]	1 !													
31		(asp/) <sub>{Asp}</sub> * (V/) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub>	1 !	1		2										

Tableau 3: /V D<sub>σ</sub>/ input type

Further, the condensed Tableau 4 illustrates the /V D<sub>σσ</sub>/ type with a heavy object. Output candidates 16-33 violate a V=WF\_MWd constraint, and 14-15 violate MWD=PRWD. Candidates 5-13 all involve cases where both the /asp/ marker and the heavy object /D<sub>σσ</sub>/ are incorporated into the MWd containing the verb. Because both /V/ and /D<sub>σσ</sub>/ are prosodically heavy, they each should project a morphological label, {V} and {D} respectively. Candidates 6-11 are only labeled with {V} while candidates 12-13 are only marked with {D}. Candidate 5 is marked with both {V} and {D}, but this violates the labeling markedness constraint \*COMPLEXMWD<sub>{LABEL}</sub>. Here, incorporation of the prosodically heavy /D<sub>σσ</sub>/ is too costly with respect to labeling constraints, and therefore appears in its own MWd. This constraint ranking therefore militates against ‘unnecessary’ local dislocation. Finally, as with the tableaux above, candidates 2-4 are eliminated as they contain an aspect marker which is not right-aligned to the MWd.


Input:		Constraint stratum (CS) 1										CS 2		CS 3	
		V=WF_MWD(AGR_SBI)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD{LABEL}	*COMPLEXMWD{LABEL}	{V}>{D}	ALIGN-/AGR_SBI/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR <sub>ASP</sub>	*AGR <sub>SBI</sub>	MAP(WD_TYPE)
1		$(/agr_{sbi}/+/V/+/asp/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$										1	1	1	1
2		$(/agr_{sbi}/+/asp/+/V/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$								1 !	1	1	1	1	
3		$(/agr_{sbi}/+/V/+/asp/+/agr_{asp}/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$								1 !	2	1	1	1	1
4		$(/agr_{sbi}/+/asp/+/V/+/agr_{asp}/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$								1 !	2	1	1	1	
5		$(/agr_{sbi}/+/V/+/D_{\sigma\sigma}/+/asp/)\{V\},\{D\},\{Asp\}$					1 !				1	1	2	2	
6		$(/agr_{sbi}/+/V/+/D_{\sigma\sigma}/+/asp/)\{V\}$				1 !					1	1	2	2	
7		$(/agr_{sbi}/+/asp/+/V/+/D_{\sigma\sigma}/)\{V\}$				1 !			1		1	1	2		
8		$(/agr_{sbi}/+/V/+/asp/+/D_{\sigma\sigma}/)\{V\}$				1 !			1		1	1	2	1	
9		$(/agr_{sbi}/+/asp/+/V/+/D_{\sigma\sigma}/+/agr_{asp}/)\{V\}$				1 !			1		2	1	2		
10		$(/agr_{sbi}/+/V/+/asp/+/D_{\sigma\sigma}/+/agr_{asp}/)\{V\}$				1 !			1		2	1	2	1	
11		$(/agr_{sbi}/+/V/+/D_{\sigma\sigma}/+/asp/+/agr_{asp}/)\{V\}$				1 !			1		2	1	2	2	
12		$(/V/+/D_{\sigma\sigma}/+/asp/)\{D\}$				1 !	1							2	2
13		$(/agr_{sbi}/+/V/+/D_{\sigma\sigma}/+/asp/)\{D\}$				1 !	1				1	1	2	2	
14		$(/asp/)\{Asp\} * (/agr_{sbi}/+/V/+/agr_{asp}/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$				1 !					2	1	1		
15		$(/asp/)\{Asp\} * (/agr_{sbi}/+/V/+/D_{\sigma\sigma}/+/agr_{asp}/)\{V\}$				1 !	1				2	1	1	1	
16		$(/asp/)\{Asp\} * (/agr_{sbi}/+/V/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$		1 !		1					1	1			
17		$(/asp/)\{Asp\} * (/agr_{sbi}/+/V/+/D_{\sigma\sigma}/)\{V\}$		1 !		1	1				1	1	1		
18		$(/V/+/asp/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$	1 !											1	1
...		[Cand 19-31]	1 !												
32		$(/asp/)\{Asp\} * (/V/)\{V\} * (/D_{\sigma\sigma}/)\{D\}$	1 !	1		1									
33		$(/asp/)\{Asp\} * (/V/+/D_{\sigma\sigma}/)\{V\}$	1 !	1		1	1							1	

Tableau 4: /V D<sub>σσ</sub>/ input type

From these tableaux, the effects of DM operations LD and DNI emerge under specific constraint rankings, shown below. Crucially, the two components of LD – namely dislocating of a morphological constituent and changing the type of a morphological constituent – are split into two sets of constraint interactions. This is expected given that these two aspects of LD are logically independent.

(38) **Emergence of DM operations LD and DNI**

- a. **DNI:** Insertion of morphological nodes not present in input

$$\left[ \begin{array}{l} V=WF\_MWd(asp) \\ V=WF\_MWd(agr_{sbj}) \end{array} \right] \gg \left[ \begin{array}{l} Dep-IO(Node) \\ *agr_{asp} \\ *agr_{sbj} \end{array} \right]$$

- b. **LD (dislocating):** Dislocating MWd/SbWd with respect to local MWd/SbWd

$$[Align-/asp/-R] \gg [LinearityMap-IO:Fnc]$$

- c. **LD (typing):** MWd to SbWd morphological type-shifting

$$\left[ \begin{array}{l} MWd=PrWd \\ V=WF\_MWd(asp) \end{array} \right] \gg [Map(Wd\_Type)]$$

I now turn to how this constraint ranking can derive the correct outputs in serial verb constructions. Each of these input-output mappings has considerably more output candidates, i.e. the /V V/ type ( $n=86$ ), the /V D<sub>σ</sub> V/ type ( $n=206$ ), and the /V D<sub>σσ</sub> V/ type ( $n=214$ ). Again, these tableaux below are condensed versions of those in Appendix 1: Evaluation (full tableaux).

Tableau 5 involves the /V V/ input. Like in the tableaux above, candidates 30-39 and 40-86 are eliminated as they violate  $V=WF\_MWD(AGR_{Sbj})$  and  $V=WF\_MWD(ASP)$  respectively. Further, candidates 23-29 violate  $MWD=PRWD$  by not incorporating /asp/, candidates 11-22 are eliminated because not all /agr<sub>sbj</sub>/ markers align to the left edge, and 3-10 are eliminated because not all /asp/ markers align to the right. Unlike in the tableaux above, there are *two* remaining candidates (1 and 2) which do not violate any constraint in CS 1; this is where the constraints in the lower strata come into effect. In both candidates, MWds which contain verbs appear with appropriate inflection and obey all alignment constraints. In candidate 2 (the loser), the verbs appear in separate MWds and each are marked with a full set of inflectional markers, incurring three violations of DEP-IO(NODE) (one for each agreement marker). In contrast, candidate 1 (the winner) involves the incorporation of /V2/ with /V1/ and /V2/ forming a single /MWd/, with only one violation of Dep-IO(Node). This winning form has additional violations of mapping constraints in CS 3, but they are non-fatal.


Input:		$[_{aspP} asp^\circ [_{v1P} v_1^\circ + V_1^\circ [ \emptyset \Psi_+^\circ [_{v2P} v_2^\circ + V_2^\circ [ \Psi_2^\circ ] ] ] ] ] ] ]$	Constraint stratum (CS) 1									CS 2		CS 3		
			V=WF_MWD(AGR_SBJ)	V=WF_MWD(ASP)	V1>V2	MWD=PRWD	MWD_{[LABEL]}	*COMPLEXMWD_{[LABEL]}	{V}>{D}	ALIGN-/AGR_SBJ/-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR_{ASP}	*AGR_{SBJ}	MAP(WD_TYPE)
1		$(/agr_{sbj}1/+/V1/+/V2/+/asp/)_{\{V\}}$										1		1	2	2
2		$(/agr_{sbj}1/+/V1/+/asp/)_{\{V\}} * (/agr_{sbj}2/+/V2/+/agr_{asp}1/)_{\{V\}}$										3!	1	2	1	1
3		$(/agr_{sbj}1/+/asp/+/V1/+/V2/)_{\{V\}}$									1!	1	1	2		
...		[Cand 4-9]									2!					
10		$(/agr_{sbj}1/+/V1/+/agr_{asp}1/+/V2/+/asp/+/agr_{asp}2/)_{\{V\}}$									2!	3	2	1	2	2
11		$(/V1/+/agr_{sbj}1/+/V2/+/asp/)_{\{V\}}$								1!		1	1	2	2	
...		[Cand 12-21]								1!						
22		$(/agr_{sbj}1/+/V1/+/agr_{asp}1/+/agr_{sbj}2/+/V2/+/asp/+/agr_{asp}2/)_{\{V\}}$								1!	2	4	2	2	2	2
23		$(/asp/)_{\{Asp\}} * (/agr_{sbj}1/+/V1/+/V2/+/agr_{asp}1/)_{\{V\}}$				1!						2	1	1	1	
...		[Cand 24-28]				1!										
29		$(/asp/)_{\{Asp\}} * (/agr_{sbj}1/+/V1/+/agr_{asp}1/+/agr_{sbj}2/+/V2/+/agr_{asp}2/)_{\{V\}}$				1!				1	1	4	2	2	1	
30		$(/agr_{sbj}1/+/V1/+/asp/)_{\{V\}} * (/agr_{sbj}2/+/V2/)_{\{V\}}$		1!								2	2	1	1	
...		[Cand 31-39]		1!												
39		$(/asp/)_{\{Asp\}} * (/agr_{sbj}1/+/V1/)_{\{V\}} * (/agr_{sbj}2/+/V2/)_{\{V\}}$		2!		1						2	2			
40		$(/V1/+/V2/+/asp/)_{\{V\}}$	1!												2	2
41		$(/agr_{sbj}1/+/V1/+/asp/)_{\{V\}} * (/V2/+/agr_{asp}1/)_{\{V\}}$	1!									2	1	1	1	1
...		[Cand 42-85]	1!													
86		$(/asp/)_{\{Asp\}} * (/V1/)_{\{V\}} * (/V2/)_{\{V\}}$	2!	2		1										

Tableau 5: /V V/ input type (Condensed tableau)

Below, Tableau 6 presents a condensed tableau with the /V D<sub>σ</sub> V/ input type and Tableau 7 presents a condensed tableau with the /V D<sub>σσ</sub> V/ type. In both tableaux, a large number of candidates are eliminated by incurring a fatal violation of highly ranked V=WF\_MWd(agr<sub>subj</sub>), V=WF\_MWd(asp), or MWd=PrWd. Of crucial importance to note, in Tableau 7 candidates 26-62 are eliminated as they have output structures involving /V/ and /D<sub>σσ</sub>/ within the a single MWd (an incorporated pronoun) but are marked by only one morphological label, parallel to the candidates eliminated in Tableau 4 with the /V D<sub>σσ</sub>/ input type. This ensures that a prosodically heavy pronoun forms its own MWd which it labels with {D} as in candidates 1-22.

In both tableaux, all other remaining candidates other than the top two are eliminated by violating an alignment constraint. The remaining two candidates in the /V D<sub>σ</sub> V/ type in Tableau 6 are differentiated as they are in the /V V/ type: candidate 2 incurs more violations of Dep-IO(Node) than candidate 1. Compare this to the two remaining candidates in the /V D<sub>σσ</sub> V/ type in Tableau 7. Here, although candidate 1  $\backslash(\text{agr}_{\text{subj}}1/+V1/+asp)\}_{V} * (D_{\sigma\sigma})_{D} * \text{agr}_{\text{subj}}2/+V2/+agr_{\text{asp}}1)\}_{V}$  incurs more violations of Dep-IO(Node) than candidate 2  $\backslash(\text{agr}_{\text{subj}}1/+V1/+V2/+asp)\}_{V} * (D_{\sigma\sigma})_{D}$ , this latter candidate loses because it incurs more fatal violations of LINEARITYMAP-IO:LEX. Recall that this constraint states that the “hierarchical order of lexical constituents x<sup>o</sup> and y<sup>o</sup> in the input is reflected in the linear order of counterparts /x/ and /y/ in the output”, and thereby limits manipulating the expected linear order of lexical exponents such as verbs and nouns/pronouns. In Tableau 7, candidate 2 violates this constraint twice as /V2/ is not linearized after the object /D/ as expected, but rather incorporates over /D/ into the MWd containing /V1/. There are several alternative constraints one could posit - e.g. one involving a kind of locality – but the result would be the same: this candidate is eliminated in favor of the double-marking pattern.



Input:		Constraint stratum (CS) 1										CS 2		CS 3	
		V=WF_MW/D(AGR <sub>SBJ</sub> )	V=WF_MW/D(ASP)	V1>V2	MWD=PRWD	MWD <sub>{LABEL}</sub>	*COMPLEXMWD <sub>{LABEL}</sub>	{V}>{D}	ALIGN-/AGR <sub>SBJ</sub> /-L	ALIGN-/ASP/-R	LINEARITYMAP-IO:LEX	DEP-IO(NODE)	*AGR <sub>ASP</sub>	*AGR <sub>SBJ</sub>	MAP(WD_TYPE)
1	☞ (/agr <sub>sbj</sub> 1/+V1/+D <sub>σ</sub> /+V2/+asp/) <sub>{V}</sub>										1		1	3	3
2	(/agr <sub>sbj</sub> 1/+V1/+D <sub>σ</sub> /+asp/) <sub>{V}</sub> * (/agr <sub>sbj</sub> 2/+V2/+agr <sub>asp</sub> 1/) <sub>{V}</sub>										3!	1	2	2	2
3	(/agr <sub>sbj</sub> 1/+asp/+V1/+D <sub>σ</sub> /+V2/) <sub>{V}</sub>								1!		1		1	3	
...	[Cand 4-15]								1~2!						
16	(/V1/+D <sub>σ</sub> /+agr <sub>sbj</sub> 1/+V2/+asp/) <sub>{V}</sub>								1!		1		1	3	3
...	[Cand 17-33]								1!						
34	(/agr <sub>sbj</sub> 1/+V1/+D <sub>σ</sub> /+V2/+asp/) <sub>{V},{D},{Asp}</sub>								1!		1		1	3	3
...	[Cand 35-36]								1!						
37	(/asp/) <sub>{Asp}</sub> * (/agr <sub>sbj</sub> 1/+V1/+D <sub>σ</sub> /+V2/+agr <sub>asp</sub> 1/) <sub>{V}</sub>										2	1	1	2	
...	[Cand 38-71]														
72	(/asp/) <sub>{Asp}</sub> * (/agr <sub>sbj</sub> 1/+V1/+agr <sub>asp</sub> 1/+agr <sub>sbj</sub> 2/+V2/+agr <sub>asp</sub> 2/) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub>									1	1	2	4	2	2
73	(/agr <sub>sbj</sub> 1/+V1/+D <sub>σ</sub> /+asp/) <sub>{V}</sub> * (/agr <sub>sbj</sub> 2/+V2/) <sub>{V}</sub>										2		2	2	2
...	[Cand 74-94]														
95	(/asp/) <sub>{Asp}</sub> * (/agr <sub>sbj</sub> 1/+V1/) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub> * (/agr <sub>sbj</sub> 2/+V2/) <sub>{V}</sub>										2		2		
96	(/V1/+D <sub>σ</sub> /+V2/+asp/) <sub>{V}</sub>									1!				3	3
...	[Cand 97-205]									1~2!					
206	(/asp/) <sub>{Asp}</sub> * (/V1/) <sub>{V}</sub> * (D <sub>σ</sub> ) <sub>{D}</sub> * (V2/) <sub>{V}</sub>										2!	2	2		

Tableau 6: /V D<sub>σ</sub> V/ input type (Condensed tableau)



#### 5.4. Morphological labeling

One innovation of this analysis is morphological labeling, e.g. MWds with verbs are marked with label {V}. Morphological labeling allows for sufficiently local verbs associated with independent V° heads to incorporate and form a single MWd, i.e. a morphological compound  $((/V1/)_{SbWd}+(/V2/)_{SbWd})_{MWd\{V\}}$ . Verbs which are not sufficiently local do not form a compound, e.g. the  $/V D_{\sigma\sigma} V/$  type does not become  $*((/V1/)_{SbWd}+(/D_{\sigma\sigma}/)_{SbWd}+(/V2/)_{SbWd})_{MWd\{V\}}$  because of conflict with the incorporated /D/ labeling this MWd with a label {D}. In other words, morphological labeling facilitates the formation of a constituent involving only words of the same lexical category (e.g. V), and disallowing such a constituent if the words are of different categories (e.g. V and D). In terms of this analysis, morphological labeling counteracts potential ‘mass local dislocation’ for well-formedness conditions, wholesale incorporating of all morphemes into a single MWd to satisfy a markedness condition.

There is support in the literature that morphological labeling. Lexical categories such as nouns and verbs often display distinct phonological profiles even in the same language, e.g. in terms of the array of phonological contrasts, resistance to assimilation, among others (see references in Smith 2011). If these differences are analyzed as part of a speaker’s synchronic grammar (rather than diachronic residue), then phonology requires access to lexical category information. For example, in Lenakel [tnl] (Oceanic: Vanuatu) primary stress falls on the penult (Lynch 1974, 1978, discussed in several places in the literature e.g. Smith 2011, Inkelas 2014, a.o.). However, secondary stress in nouns falls on every other syllable from the primary stress, whereas in verbs it is assigned from the initial syllable of the word (in both simplex and complex stems).

#### (39) Lenakel secondary stress

- a. Nouns: secondary stress assigned rightward from primary-stress
- i. / nim<sup>w</sup>akilakil / [ ni.m<sup>w</sup>ḡ.ḡə.lá.ḡəl ] ‘beach’ (Lynch 1978:19)
  - ii. / kam-lomhanteni / [ kam.lò.ḡan.dé.ni ] ‘for Lomhanteni’ (Lynch 1974:83)
  - iii. / kam-titoḡa / [ kám.d<sup>ʷ</sup>i.dó.ḡa ] ‘for Titoḡa’ (Lynch 1974:183)
- b. Verbs: secondary stress assigned leftward from initial syllable
- i. / n-im-ausito / [ ni.maw.sí.do ] ‘you (sg.) told a story’ (Lynch 1974:66)
  - ii. / n-im-ai-ausito / [ ni.ma.yu.sí.do ] ‘you (pl.) told a story’ (Lynch 1974:66)
  - iii. / t-n-ak-am-ar-olkeikei / [ ti.na.gá.ma.řol.géy.ḡey ] ‘you (pl.) told a story’ (Lynch 1978:19)

Additionally, in Finnish there are vowel changes to stems when they appear adjacent to plural *-i*. With nouns, there is a preference for stem-final /a/ to change to /o/ in this context, but with adjectives in the same context there is a preference to delete stem-final /a/.

#### (40) Finish stem vowel alternation when adjacent to PL *-i* (Anttila 2002:13)

- a. Nouns: /a/ to /o/ change preferred
- / kihara-i-ssa / ‘curl-PL-INESSIVE’ [ kiharo-i-ssa ]
- b. Adjectives: deletion of /a/ preferred
- / kihara-i-ssa / ‘curly-PL-INESSIVE’ [ kiharØ-i-ssa ]

Smith (2011) also notes English as an example (albeit a complicated one), where there is “a preference (not a requirement) for initial/trochaic stress in disyllabic nouns versus final/iambic stress in disyllabic verbs”.

It should be noted that cases where distinct noun vs. verb phonology is mirrored in morphologically complex derivatives is rare, as discussed in Inkelas (2014:14-15,50-59).<sup>18</sup> Further, morphological labeling predicts to find morphological and phonological operations (clitic alignment requirements, phonological distributions or alternations) sensitive to the particular morphological label {M}, e.g. a language where tone spreads onto a MWd with label {V} but not {N} (controlling for relevant factors). This theory therefore makes testable predictions which can be evaluated within a larger typology of category-specific effects.

#### 5.5. Discussion of post-syntactic architecture

<sup>18</sup> Inkelas notes that “it is much harder to find a language in which one phonological generalization holds of all nouns, whether monomorphemic or derived, and different phonological generalization holds of all verbs, whether monomorphemic or derived” (p. 51), and that “even Japanese, perhaps the most-cited example in the literature of a noun-verb asymmetry because of its accentuation patterns, does not generalize the asymmetry to complex nouns and verbs” (p. 52).

As stated above summarizing the major tenets of DM (section 2.1), OT-DM alters the architecture of the syntax-phonology interface by modeling it as parallelist and constraint-based rather than serialist and rule-based. This interface is diagrammed below as envisioned under OT-DM in Figure 2, adapted from Harley's (2014:228) DM schema and Broekhuis & Vogel's (2013:10) interface schema. See Rolle (2018: ch. 4) for expanded diagrams.

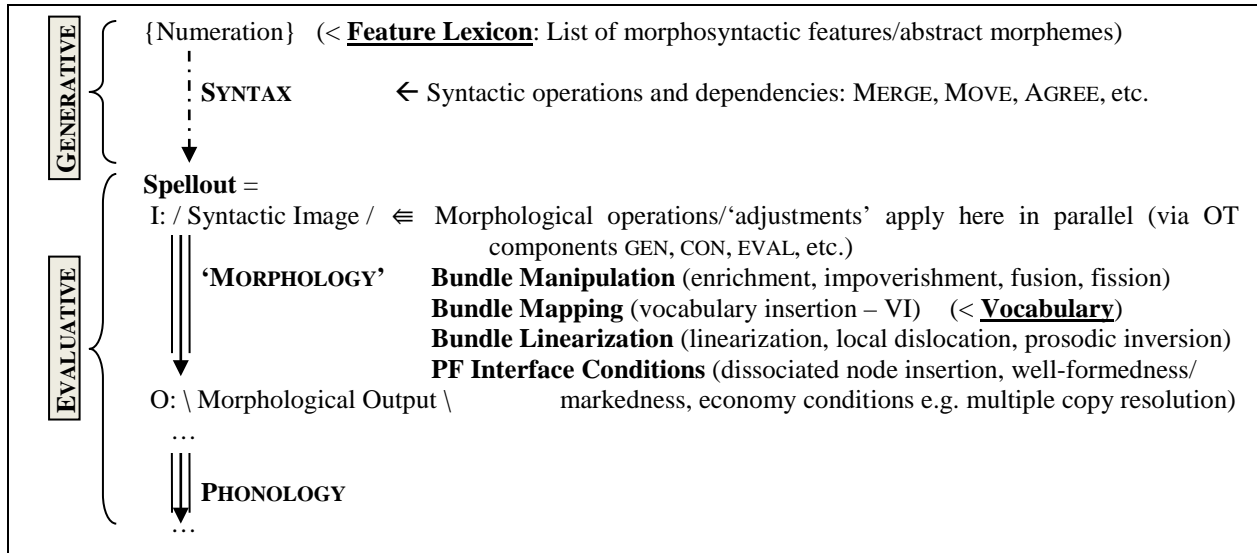


Figure 2: Revision of DM model according to OT-DM (PF branch only)

In this model, the numeration represents selecting a set of morphosyntactic features and feature bundles from the Feature Lexicon which are then subject to syntactic operations (e.g. MERGE, MOVE, AGREE, etc). At a certain point, this syntactic product is sent to spellout, which we can assume is triggered by a phase head (though the exact trigger of spellout is orthogonal to the present discussion). Under standard assumptions, spellout splits into two branches: a Phonetic/Phonological Form (PF) and a Logical Form (LF). The present alterations of the DM model affect the PF branch only.

The output of syntax which is sent to spellout is what I call the **Syntactic Image**. This image retains syntactic constituency and dependencies, but can no longer be manipulated by syntactic operations. This syntactic image is subject to a series of morphological operations and adjustments at spellout. These include: (1) **Bundle Manipulation** which alter the morphosyntactic featural content of input bundles (enrichment, impoverishment, fusion, fission), (2) **Bundle Mapping** (i.e. Vocabulary Insertion) which inserts Vocabulary Items from the Vocabulary into terminal nodes and is where phonological content is supplied, (3) **Bundle Linearization**, which essentially translates the mobile-like hierarchical structure to a flat linear structure (linearization, local dislocation, prosodic inversion, etc.), and (4) **PF Interface Conditions** which enforce morphology specific requirements (e.g. dissociated node insertion, multiple copy resolution, a.o.). Under this conception, ‘morphology’ (here in scare quotes) and spellout are essentially synonymous.

As demonstrated in the previous section, a candidate set generated from GEN is evaluated and the optimal candidate is selected during the spellout stage, which is in turn fed to the Phonology module. OT-DM therefore unifies all post-syntactic operations under the same mechanisms: a ranked/weighted constraint set from CON, a list of output candidates from GEN, and an operation evaluating these candidates via EVAL. We can understand this as the **Evaluative** component, in contrast with the pre-spellout **Generative** component.

The strongest form of this proposal is that all morphological operations take place in parallel and are not crucially ordered, which I call the **Morphology in Parallel Hypothesis (MPH)**.

#### (41) Morphology in Parallel Hypothesis (MPH):

All morphological operations occur in parallel in a constraint-based model

MPH has a number of advantages. Given that Rules & Constraints DM à la Arregi & Nevins (2012) employs both rules and constraints, this results in a duplication problem which this hypothesis avoids (as stated in section 4.5). One of the original motivations of OT was eliminating duplication, as a constraint-based OT model accomplishes repairs and blocking and all other functions of a generative grammar (Prince & Smolensky 2004:239). Further, using

the same architectural mechanics for both phonology and morphology is actually in the spirit of several practitioners of DM, such as Arregi & Nevins' (2012) design factor *Crossmodular Structural Parallelism* (see also discussion in Bobaljik 2017: section 3.4). In total, OT-DM is conceptually preferable as a theory of morphology and the interface, and is empirically superior in accounting for Degema and a number of other cases identified throughout this study.

## 6. Conclusion

This paper provided support for a modified DM model which I call Optimality Theoretic Distributed Morphology (OT-DM). The strongest form of this model was that all morphological operations take place in parallel, which I called the Morphology-in-Parallel Hypothesis (MPH). Although combining OT and DM is unorthodox in practice, I showed that a growing body warrant this modification, and provided evidence for OT-DM from a morphological conspiracy involving verbal clitics in Degema (Nigeria). To account for the Degema data, I adopted that agreement clitics are inserted post-syntactically via the DM operation Dissociated Node Insertion (DNI), and further that verb complexes are formed post-syntactically via the operation Local Dislocation (LD). I argued for an analysis involving a well-formedness markedness constraint which requires verbs to appear in properly inflected words on the surface. DM operations were decomposed into a series of constraints which were crucially ranked. Candidates were freely generated from GEN and subject to all DM operations, and were evaluated via EVAL against the ranked constraint set. Finally, I illustrated that under the standard serial DM model in which DNI proceeds VI, this would result in the wrong output form, and that even after parameterizing DM operation order in response, this model would not adequately account for the morphological data. The major ramification of this model for interface architecture is that like the phonological module, spellout is an optimizing input-output mapping fed from syntax (the syntactic image) whereby morphological operations apply in parallel rather than serially.

## 7. Glosses, abbreviations, and conventions

Gloss		Abbreviation		Convention	
1	first person	cl	clitic	//	input
2	second person	D <sub>σ</sub>	pronoun of as specific syllable count	\\	output
3	third person	DNI	Dissociated Node Insertion	x	not attested
AUX	auxiliary	DP	Determiner Phrase	(?)	acceptable but dispreferred
FAC	factative tense/aspect	LD	Local Dislocation	?	unnatural and dispreferred
NEG	negative	MO	morphological output	?*	grammatically questionable
NPM	non-past marker	MPH	Morphology-in-Parallel Hypothesis	*	ungrammatical
PL	plural	OT-DM	Optimality Theoretic Distributed Morphology	%	indicates inter-speaker variability
PRF	perfect aspect	R&C DM	Rules & Constraints Distributed Morphology		
SET1	set 1 proclitic	SI	syntactic input		
SET2	set 2 proclitic	SVC	serial verb construction		
SG	singular	V	verb		
		VI	Vocabulary Insertion		

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## 10. Appendix 1: Evaluation (full tableaux)

[See supplemental files “FilesForappendix1\_nllt” and “appendix 1 degema tableaux.xlsx”]

## 11. Appendix 2: Factorial typology of constraint set

[See supplemental files “FilesForappendix2\_nllt\_factyp” and “appendix 2 degema factorial typology.xlsx”]

Within Optimality Theory, a factorial typology refers to determining all the logical rankings of a set of constraints and computing the different winning sets of output candidates (Kager 1999:35). A factorial typology is particularly useful in determining if there are pathological predictions from a set of constraints. In the current data set, a potential example of a pathological prediction would be a grammar which inserted subject agreement when there is a prosodically light object but not when there is a prosodically heavy one. By default, we expect the presence of subject agreement and the prosodic type of object to be orthogonal. This pathological grammar is not generated by the set of constraints proposed.

A factorial typology was determined using OTSoft v2.5 (Hayes et al. 2013). There were 15 constraints considered, making the logically possible number of grammars the factorial 15! (1,307,674,368,000). Restricting our

inputs to the 6 input types presented above, the factorial typology resulted in 128 distinct grammars. The factorial typology does not reveal any straightforward pathological predictions, and therefore this constraint set is sufficiently restrictive. Major parameters of output variation include (1) not incorporating /D<sub>σ</sub>/, (2) lacking subject agreement, (3) not incorporating /asp/ but having aspect agreement, (4) not dislocating /asp/ to the right edge, (5) dislocating /V2/ over a pronoun /D/, and (6) not incorporating /V2/ resulting in /V1/ and /V2/ forming separate MWds, with each verb receiving separate inflection i.e. the double-marking pattern.

A grammar of this last type is provided below with Grammar 18 (*not* the attested Degema patterns). Recall from section 3.2 that the /V V/ and /V D<sub>σ</sub> V/ types with double-marking is interpreted as dispreferred <sup>(?)</sup> to ungrammatical \* in this dialect of Degema depending on speaker. A grammar which optimizes double-marking here can be derived if we reorder constraint stratum 3 over constraint stratum 2, as shown below (C-Strata order established in the Tableaux in section 5 above).

Input type	Grammar 18 - /V2/ appears in its own MWd
/V/	→ (/agr <sub>sbj</sub> /+/V/+/asp/) <sub>{V}</sub>
/V V/	→ (/agr <sub>sbj</sub> 1/+/V1/+/asp/) <sub>{V}</sub> * (/agr <sub>sbj</sub> 2/+/V2/+/agr <sub>asp</sub> 1/) <sub>{V}</sub>
/V D <sub>σ</sub> /	→ (/agr <sub>sbj</sub> /+/V/+/D <sub>σ</sub> /+/asp/) <sub>{V}</sub>
/V D <sub>σ</sub> V/	→ (/agr <sub>sbj</sub> 1/+/V1/+/D <sub>σ</sub> /+/asp/) <sub>{V}</sub> * (/agr <sub>sbj</sub> 2/+/V2/+/agr <sub>asp</sub> 1/) <sub>{V}</sub>
/V D <sub>σσ</sub> /	→ (/agr <sub>sbj</sub> /+/V/+/asp/) <sub>{V}</sub> * (D <sub>σσ</sub> ) <sub>{D}</sub>
/V D <sub>σσ</sub> V/	→ (/agr <sub>sbj</sub> 1/+/V1/+/asp/) <sub>{V}</sub> * (D <sub>σσ</sub> ) <sub>{D}</sub> * (/agr <sub>sbj</sub> 2/+/V2/+/agr <sub>asp</sub> 1/) <sub>{V}</sub>

$\left[ \begin{array}{l} \text{CS 3} \\ \text{Map(Wd\_Type)} \\ \text{Linearity-IO:Fnc} \end{array} \right]$	»	$\left[ \begin{array}{l} \text{CS 2} \\ \text{DEP-IO(Node)} \\ *agr_{asp} \\ *agr_{sbj} \end{array} \right]$
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Table 12: Constraint strata ranking and output candidate which corresponds to <sup>(?)</sup>~\*~\* grammaticality interpretation

A sample of grammars generated by the factorial typology is in Table 13.

Grammar	Type	I: /V D <sub>σ</sub> V/	I: /V D <sub>σσ</sub> V/	Ranking differences compared to attested
18 No V2 Inc	Don't incorporate /V2/	(sbj+V+D <sub>σ</sub> +asp) (sbj+V+asp)	(sbj+V+asp) (D <sub>σσ</sub> ) (sbj+V+asp)	$\left[ \begin{array}{l} \underline{1} \\ \text{Map(Wd\_Type)} \\ \text{Linearity-IO:Fnc} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{DEP-IO(Node)} \\ *agr_{asp} \\ *agr_{sbj} \end{array} \right]$
47 No Asp Inc	Don't incorporate /asp/ into /V/	(asp) (sbj+V+D <sub>σ</sub> +V)	(asp) (sbj+V) (D <sub>σσ</sub> ) (sbj+V)	$\left[ \begin{array}{l} \underline{1} \\ *agr_{asp} \\ \text{LinearityMap-IO:Fnc} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{V=WF\_MWd(asp)} \\ \text{MWd=PrWd} \end{array} \right] \gg \left[ \begin{array}{l} \underline{3} \\ \text{Map(Wd\_Type)} \end{array} \right]$
15 V Over D	Incorporate /V2/ over /D/	(sbj+V+V+asp) (D <sub>σ</sub> )	(sbj+V+V+asp) (D <sub>σσ</sub> )	$\left[ \begin{array}{l} \underline{1} \\ *agr_{asp} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{Map(Wd\_Type)} \\ \text{Lin-IO:Fnc} \end{array} \right] \gg \left[ \begin{array}{l} \underline{3} \\ \text{MWd=PrWd} \\ \text{Lin-IO:Lex} \end{array} \right]$
74 Inc w/o Agr	V incorporation without agreement	(asp) (V+D <sub>σ</sub> +V)	(asp) (V) (D <sub>σσ</sub> ) (V)	$\left[ \begin{array}{l} \underline{1} \\ \text{Dep-IO(Node)} \\ *agr_{asp} \\ *agr_{sbj} \\ \text{Lin-IO:Fnc} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{V=MF\_MWd(agr}_{sbj}) \\ \text{V=MF\_MWd(asp)} \\ \text{MWd=PrWd} \end{array} \right]$
68 Cond Inc D	Incorporate D only if incorporate V2	(asp) (V+D <sub>σ</sub> +V)	(asp) (V+D <sub>σσ</sub> +V)	$\left[ \begin{array}{l} \underline{1} \\ \text{Dep-IO(Node)} \\ *agr_{asp} \\ *agr_{sbj} \\ \text{Lin-IO:Fnc} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{V=MF\_MWd(agr}_{sbj}) \\ \text{V=MF\_MWd(asp)} \end{array} \right] \gg \left[ \begin{array}{l} \underline{3} \\ \text{MWd}_{\{label\}} \\ \text{Map(Wd\_Type)} \end{array} \right] \gg \left[ \begin{array}{l} \underline{4} \\ \text{MWd=PrWd} \end{array} \right]$
7 D Label Repair	Bear label {D} to avoid agreement	(sbj+V+D <sub>σ</sub> +V+asp) <sub>{V}</sub>	(V+D <sub>σσ</sub> +V+asp) <sub>{D}</sub>	$\left[ \begin{array}{l} \underline{1} \\ *agr_{asp} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{Dep-IO(Node)} \\ *agr_{sbj} \end{array} \right] \gg \left[ \begin{array}{l} \underline{3} \\ \text{MWd}_{\{label\}} \\ \{V\} > \{D\} \end{array} \right]$
70 Multiple Labels	Distinct effects when have multiple labels	(asp) (V+D <sub>σ</sub> +V) <sub>{V}</sub>	(V+D <sub>σσ</sub> +V+asp) <sub>{V}{D}{ASP}</sub>	$\left[ \begin{array}{l} \underline{1} \\ \text{Dep-IO(Node)} \\ *agr_{asp} \\ *agr_{sbj} \end{array} \right] \gg \left[ \begin{array}{l} \underline{2} \\ \text{V=MF\_MWd(agr}_{sbj}) \end{array} \right] \gg \left[ \begin{array}{l} \underline{3} \\ *ComplexMWd_{\{label\}} \\ \text{Map(Wd\_Type)} \\ \text{Lin-IO:Fnc} \end{array} \right] \gg \left[ \begin{array}{l} \underline{4} \\ \text{V=WF\_MWd(asp)} \\ \text{MWd=PrWd} \end{array} \right]$

Table 13: Sample of grammars from factorial typology

In Grammar 47 No Asp Inc, /asp/ is not incorporated into a surrounding verb and there is no aspect agreement. In Grammar 15 **V Over D**, /V2/ incorporates into the MWd containing /V1/ but the object /D/ is not incorporated. In this type, /V2/ actually incorporates over /D/ resulting in a change in word order. On the surface, therefore, such grammars may be ambiguous to speakers whether they involve this type of post-syntactic incorporation, or syntactic head movement like the one discussed above (Collins' analysis of #Hoan verb compounds in section 12.1).

Grammar 74 **Inc w/o Agr** involves the incorporation of /V2/ into /V1/ without the presence of agreement, i.e. an optimal output  $\backslash(\text{asp}) (V+D+V)\backslash$ . Such a structure results when constraints requiring verbal inflection (i.e.  $V=\text{WF\_MWD}(\text{agr}_{\text{subj}})$  and  $V=\text{WF\_MWD}(\text{asp})$ ) are ranked *below* constraints disallowing these morphemes (i.e.  $*\text{agr}_{\text{subj}}$  and  $*\text{agr}_{\text{asp}}$ ) but *above* a mapping constraint requiring terminal nodes map to MWds (i.e.  $\text{Map}(\text{Wd\_Type})$ ). In this case, incorporation takes place because it has less violations of the  $V=\text{WF}$  constraints.

Grammar 68 **Cond Inc D** involves incorporating /D/ only under the conditions that /V2/ is also incorporated, i.e. a non-SVC output  $\backslash(\text{asp}) (V) (D_{\sigma\sigma})\backslash$  but a SVC output  $\backslash(\text{asp}) (V+D_{\sigma\sigma}+V)\backslash$ . In this case, /D/ is incorporated only if it would otherwise 'get in the way' of V2 incorporating, and not otherwise. The constraint ranking which accounts for this involves ranking the  $V=\text{WF\_MWD}$  constraints and  $\text{Map}(\text{Wd\_Type})$  crucially above  $\text{MWd}=\text{PrWd}$ .

The final two grammars involve morphological labeling, as discussed in section 5.4, and require special attention. In grammar 7 **D Label Repair**, the optimal output  $\backslash(V+D+V+\text{asp})_{\{D\}}\backslash$  bears a label {D} rather than the label {V} in order to avoid a violation for not bearing agreement. This output is found in grammars 7, 14, 16, 27, 29, 36, 43, 45, 50, 57, 59, and 64. Similarly, grammar 70 **Multiple Labels** involves effects when one of the candidates has multiple labels. In this case when the optimal output candidate has a {V} label, the /asp/ marker surfaces appears in its own MWd, whereas in another derivation the optimal output has {V}, {D}, and {Asp} labels and /asp/ appears at the right edge of this MWd. This output is found in grammars 39, 46, 53, 60, 70, 77, 84, and 91.

It is unclear at this point whether the last two types of grammars constitute pathological predictions of the constraint set. This is because although candidates were generated systematically along several important dimensions (described in section 5.2), generating the complete list of candidates with different morphological labels was not feasible for this project. I therefore suspect that these final two grammar types are merely an artefact of the limited number of candidates evaluated in this study with respect to different morphological labels.

## 12. Appendix 3: Against two alternatives to the OT-DM analysis

### 12.1. Alternative 1 – Syntactic verb movement

One alternative to the OT-DM analysis is what I refer to as the **syntactic verb movement alternative**. Recall from the discussion of the syntax of Degema SVCs in section 3.3 that I assume a vP complementation structure of SVCs where  $V_1$  selects  $v_2P$  as its complement:  $[_{\text{ASP}} \text{ASP}^\circ [_{\text{VP}} v_1^\circ [ V_1^\circ [_{\text{VP}} v_2^\circ [ V_2^\circ ] ] ] ] ]$  (Collins 1997, 2002). I have called verbs in the single-marking clitic pattern a morphological compound based on their acting as a single constituent with respect to clitic marking (and grammatical tone – section 4.4). Under my analysis, both single-marking and double-marking SVCs share the same syntactic structure and are subject to the same sequence of syntactic operations. In other words, both patterns are syntax-equivalent up to the point of spellout.

In contrast, the syntactic verb movement alternative derives the constituency of the two verbs by overt syntactic head-movement, whether by V2 moving to V1 directly, or both V1 and V2 moving to the same higher functional head such as  $v_1$ . Under this alternative, single-marking is attributed to the verbs forming a syntactic compound and therefore are inflected like non-compound verbs with a single set of clitics. Double-marking is attributed to the lack of syntactic verb movement under specific conditions resulting in the two verbs being spelled-out as separate words.

Syntactic verb movement in SVCs is argued for in Collins' (2002) analysis of #Hoan verb compounds [huc] (Kxa: Botswana), exemplified in (42). Here, the verbs cluster in a pre-object field and are marked by a single aspect marker *a-*. Both arguments of the verbs appear afterwards.

(42) Verb compound derived via syntactic movement in #Hoan (Collins 2002:1)

ma	a-	[	<b>qllhu</b>	'o	]	djo	ki	kx'u	na
1SG	PROG	[	<b>pour</b>	<b>put.in</b>	]	water	PART	pot	in
		[	V1	V2	]	O1		O2	

'I am pouring water into the pot.'

I refer the reader to the original paper for syntactic details of this analysis.

This alternative is attractive in that it nullifies the need for local dislocation sensitive to particular lexical categories, and unifies the application of dissociated node insertion of agreement heads without stipulation. This

syntactic alternative therefore provides us the best chance of success in accounting for the Degema patterns by appealing only to syntax, without the need for post-syntactic constraints, optimization, and output-sensitivity.

### 12.1.1 Argument 1: Phonologically null objects show single-marking pattern

The first argument against the syntactic alternative is that phonologically null objects of V1 show the single-marking pattern. I demonstrated above that there is no semantic difference between the single- and double-marking pattern: all SVC types may show either pattern depending on the surface order of nouns and verbs, e.g. examples (7)-(8) above. Consider the data in (43) involving question words in SVCs. When the question word *ovo* ‘who’ appears in-situ in object position (ex. a.), the verbs are not sufficiently local and therefore cannot form a single MWd. As a consequence, each is marked with a set of clitics, the double-marking pattern. When the question word appears ex-situ in a cleft construction, no object then intervenes between the verbs and they become sufficiently local and appear with single-marking (ex. b.). It is ungrammatical in this ex-situ context to mark the verbs with double-marking.

#### (43) Question word patterns in SVCs

##### a. In situ – Double-marking pattern

mi=dúw=n                      **óvo**                      mị=tá=an ?  
 1SG.SET2=follow=FAC **who**                      1SG.SET2=go=FAC  
 ‘I went with **who**?’ (E.E. Kari p.c.)

##### b. Ex situ – Single-marking pattern

**ovó<sub>i</sub>**    nù    mi=dúw                      *t<sub>i</sub>*    tá=ān ?    (Cf. Ungram. \*Ovó<sub>i</sub>    nù    mi=dúūw *t<sub>i</sub>*    mị=tá=ān ?)  
**who**    that    1SG.SET2=follow                      **who**    go=FAC  
 ‘**Who** did I go with?’ (Rolle & Kari 2016: 155; E.E. Kari p.c.)

Likewise, example (44) shows that single-marking surfaces when an object is not present after V1 due to focus clefting (a.), relativization (b.), or object *pro*-drop (c.). This last example is especially telling as it involves object drop from two transitive verbs, resulting in five sufficiently local verbs. All five verbs form a MWd, with one proclitic on V1 and one enclitic on V5, and a H tone melody over the entire verbal complex.

#### (44) Single-marking pattern whenever verbs are sufficiently local

##### a. Focus via clefting

kú    **óy<sub>i</sub>**    nù    mi=dúw                      *t<sub>i</sub>*                      tá=ān  
 not    **her/him**    that    1SG.SET2=follow                      **her/him**    go=FAC  
 ‘It was not **her/him** that I went with’ (E.E. Kari p.c.)

##### b. Relativization

**owé<sub>i</sub>**                      nù    mi=dúw                      *t<sub>i</sub>*                      tá=tē    [Cf. Ungram. \*owé<sub>i</sub>    nù    mi=dúw=tē *t<sub>i</sub>*    mị=tá=tē]  
**person**                      that    1SG.SET2=follow                      **person**                      go=PRF  
 ‘the person whom I have gone with’ (E.E. Kari p.c.)

##### c. Object drop (indicated by Ø)

Ohoso    ọ=tá                      đẹ    Ø                      vọ    Ø                      yí                      kíyé=n    ọy<sub>i</sub>  
 Ohoso    3SG.SET2=go    buy    Ø                      take    Ø                      come                      give=FAC    her/him  
 ‘Ohoso went and bought (something) and brought (it) to her/him.’ (Kari 2004: 121)

These data illustrate that clitic marking is insensitive to the selectional properties of the verbs, e.g. transitive vs. intransitive verb roots. If single-marking were the result of syntactic head movement, movement of the lower V2 head upwards would be triggered by a feature of a higher functional head. Under standard Minimalist assumptions, this predicts that by default when the syntactic structural condition is met, verb movement takes place. We therefore expect for single and double-marking patterns to be stable in the absence of an intervening object, as the presence of an object is orthogonal to the presence of a strong feature on a functional head. This is in particularly expected under a *Copy Theory of Movement* (Nunes 1995), where ‘traces’ are simply lower copies of moved constituents and are present in the syntax, but deleted at spellout. These expectations would not be borne out under the syntax-only alternative.

### 12.1.2 Argument 2: Unmotivated ‘blocking’ of head movement by an overt object

The second argument is that there is unmotivated ‘blocking’ of head movement by an overt object between V1 and V2, a counterpart to the first argument. Under the syntactic head movement alternative, V2 undergoes movement when triggered by a strong feature on a higher functional head. This movement therefore should be insensitive to

whether there is an overt object present. Recall from the #Hoan verb compound example in (42) above that both verbs are subject to movement past their arguments, resulting in a [V1+V2 O1 O2] order (whether in complement or specifier position). In general, in languages exhibiting verb compounding which (superficially) resemble the #Hoan type, the presence of an overt object does not block verb compounding (see Rolle & Kari 2016: 155 for languages/references).

We can compare this to the Degema facts. In Degema, V2 does not move over an intervening object to form a constituent with V1. For example, in (45) the transitive verbs *tam* ‘chew’ and *dony* ‘swallow’ appear in a SVC and share the internal object *idíyom* ‘food’. The object appears in its expected position between the verbs. It is ungrammatical to move V2 past the object, as in b. Similarly, (46) shows that verb movement is equally disallowed with a transitive VIP and an intransitive V2. Here, V1 and V2 cannot appear adjacent.

(45) No verb movement with two transitive verbs sharing internal argument

a. Grammatical  $cl=V$  O  $cl=V$

Jzakume ó=tam ídíyom o=dóny  
 Jzakume NEG\3SG.SET1=chew food 3SG=swallow  
 ‘Jzakume did not chew food and swallow’ (Kari 2003a: 278)

b. Ungrammatical  $*cl=V+V_i$  O  $t_i$

\*Jzakume ó=tam+dóny ídíyom *t\_i*  
 Jzakume NEG\3SG.SET1=chew+swallow food swallow  
 Intended: ‘Jzakume did not chew food and swallow’ (Rolle & Kari 2016:155)

(46) No verb movement with two transitive verb + intransitive verb (no argument sharing)

Breno o=dúw mé tá=ān Cf. Ungram. \*Breno o=dúw+tá\_i mé=ēn *t\_i*  
 Breno 3SG.SET1=follow me go=FAC 3SG.SET1=follow+go me=FAC go  
 ‘Breno went with me.’ (Rolle & Kari 2016: 154)

It is unclear how the presence of an object in this specifier position could act as a syntactic blocker for head-movement, and weakens support for the syntactic movement alternative.<sup>19</sup>

### 12.1.3 Argument 3: SVCs with prosodically light pronouns show single-marking

A third argument against V2 head movement involves prosodically light pronouns. Recall that although objects generally block the single-marking SVC pattern, intervening prosodically light pronouns require it, i.e. the  $cl=[V_1 D_\sigma V_2]=cl$  pattern. Under the syntactic movement alternative, because V1 and V2 form a single syntactic word via head-movement, and because  $D_\sigma$  still intervenes between them, it would have to be the case that  $D_\sigma$  also undergoes syntactic movement to this same complex head, a type of syntactic pronoun incorporation.

This is problematic for a number of reasons. First, recall that only prosodically light pronouns show incorporation; prosodically heavy pronouns condition the double-marking pattern. If under the syntactic movement analysis pronouns are also subject to syntactic incorporation, it is not clear how the syntactic trigger could only target prosodically light pronouns rather than all pronouns with an appropriate feature [D]. Under DM assumptions, syntax would not have access to phonological information before spellout. Moreover, recall that the light pronouns do not form any natural class either with respect to their morphosyntactic features. Light pronouns expone feature bundles 1SG, 2SG, 2PL, and 3PL, while heavy pronouns expone 3SG and 1PL (see Table 3).

Further, monosyllabic pronouns and bisyllabic pronouns do not exhibit different syntactic behavior. For example, prosodically light pronouns do not behave like syntactically incorporated pronouns, e.g. they are able to undergo clefting to express focus.

(47) Prosodically light pronouns can be clefted

a. Wóo ɸ=món mé=ēn  
 you 2SG.SET2=see me=FAC  
 ‘You saw me.’ (Kari 2004: 164)

<sup>19</sup> A limited pattern of verb compounding of this type exists in Degema with the verb *kíye* ‘give’. In a SVC, an allomorph of this verb *kẹ* appears right-adjacent to the other verb in the SVC, even if that other verb appears with an overt object. These patterns have not been analyzed at this time, and are superficially ambiguous between verbs in series versus grammaticalization of the verb *kíye* ‘give’ into a benefactive functional head *kẹ*.

- b. O=yí=n                      **mé**              nù wọ u=móǝn                      *t<sub>i</sub>*  
 3SG.SET2=be=FAC              **me**              that you 2SG.SET2=see\FAC              **me**  
 ‘It was I whom you saw’ (Kari 2004: 164)

If the pronoun internally merges with a verb via head movement, and then subsequently moves out of that complex, this would be a type of ‘excorporation’ (Roberts 1991, 2011). There is very limited evidence for bona fide excorporation in the literature, with many arguing against the possibility of it (e.g. Julien 2002: 67-87 and references therein, Matushansky 2006: 95, a.o.).

## 12.2. Alternative 2 - Deletion-under-identity of intermediate clitics

Another alternative is what I term the **deletion-under-identity (DUI) alternative**. Under this alternative, the grammar uniformly generates a full set of proclitics and enclitics on all verbs in a SVC, but under specific conditions involving identity there is obligatory deletion of intermediate clitics (assumed to be a type of ellipsis). This is schematized in (48) below.

(48) Alternative 2 - Deletion-under-identity of intermediate clitics

	Single-marking pattern	Double-marking pattern
a. Uniform clitic marking	agr <sub>sbj</sub> =V <sub>1</sub> = <b>asp</b> $\emptyset$ agr <sub>sbj</sub> =V <sub>2</sub> =agr <sub>asp</sub>	agr <sub>sbj</sub> =V <sub>1</sub> = <b>asp DP</b> agr <sub>sbj</sub> =V <sub>2</sub> =agr <sub>asp</sub>
b. Deletion-under-identity	agr <sub>sbj</sub> =V <sub>1</sub> = <b>asp</b> $\emptyset$ agr <sub>sbj</sub> =V <sub>2</sub> =agr <sub>asp</sub>	agr <sub>sbj</sub> =V <sub>1</sub> = <b>asp DP</b> agr <sub>sbj</sub> =V <sub>2</sub> =agr <sub>asp</sub>
c. Surface pattern	agr <sub>sbj</sub> =V <sub>1</sub> V <sub>2</sub> =agr <sub>asp</sub>	agr <sub>sbj</sub> =V <sub>1</sub> = <b>asp DP</b> agr <sub>sbj</sub> =V <sub>2</sub> =agr <sub>asp</sub>

DUI would take place under two conditions: (1) the deleted clitics appear adjacent, and (2) the clitics be featurally identical. One advantage of this alternative is that Dissociated Node Insertion would take place uniformly on all verbs, and avoid any need to license Local Dislocation of verbs. This would therefore be compatible with a strictly serial rule-based analysis, and not warrant modifying core DM architecture. Such an alternative is flexible and could come in two flavors. The first would be that each verb’s extended projection in the SVC contains a separate Asp° head; therefore the second aspect morpheme would not be agr<sub>asp</sub> (see discussion in section 3.3). The second would be that there is one Asp° head, followed by concord aspect agreement. Both of these structures would result in the same input to a DUI operation.

There is precedence for similar types of DUI, e.g. coordination/conjunction reduction (Merchant 2012), ‘suspended affixation’ (Kabak 2007, Guseva & Weissner 2018), and certain cases of verbal ‘unbalanced coordination’ (Johannessen 1998). An example of coordinate reduction in German nouns is in (49) below, where the medial morpheme *schaft* adjacent to the coordinator is deleted under identity.

- (49) Coordinate reduction – German nouns  
 [[Freund] ~~schaft~~] oder [[Feind] schaft]  
 ‘Friendship or hostility’ (Booij 1985: 144)

I present two arguments against a DUI alternative. The first is that this analysis makes the wrong predications and overgenerates with respect to a fuller set of Degema data. For example, one context which meets the surface conditions (adjacency and featural identity) is covert coordination and other conjoined clauses. Covert coordination involves two clauses adjacent without a phonologically overt coordinator as in (50)a. The second clause can involve a linker auxiliary, e.g. *kírí* ‘also.AUX’ in (50)b. However, in these contexts DUI is not found and is in fact ungrammatical.

(50) Lack of DUI in conjoined clauses - Double-marking pattern obligatory

- a. [V<sub>1</sub>] & [V<sub>2</sub>]  
 Ivioso o=kótú                      mé=**ēn**              q=kpérí=n                      ĩnúm  
 Ivioso 3SG.SET2=call me=FAC 3SG.SET2=tell=FAC something  
 ‘Ivioso called me and told (me) something’ (Kari 2003a:274)
- b. [V<sub>1</sub>] & [aux V<sub>2</sub>]  
 Tatane o=kpé**ēny**                      q=kírí                      wááy  
 Tatane 3SG.SET2=wash\FAC 3SG.SET2=also.AUX spread\FAC  
 ‘Tatane washed and also spread (something)’  
 cf. \*...o=kpény  $\emptyset$  kírí wááy (E.E. Kari p.c.) [ohk\_201708]

- c. [V<sub>1</sub>] but [V<sub>2</sub>]  
 ó=kú                      dí    báaw    dɔ    ɔ=rékéréké            dí=ín  
 3SG.SET2=did.AUX    eat    them\FAC    but    3SG.SET2    be.slow    eat=FAC  
 ‘She did eat them but she ate them rather slowly’  
 cf. \*ó=kú dí báaw dɔ Ø rékéréké dí=ín  
 cf. \*ó=kú dí báaw Ø dɔ ɔ=rékéréké dí=ín  
 cf. \*ó=kú dí báaw Ø dɔ Ø rékéréké dí=ín    (E.E. Kari p.c.)

The following example in (51) comes from a Degema text (Kari 1997). In this context, two events are being described – one *moving* and one *settling* – each expressed in Degema by two SVCs in two clauses. Within each SVC, the verbs appear adjacent and therefore show single-marking. However, across the SVCs, because they appear in distinct clauses they are not conflated into one larger single-marking structure. Pronunciation of this sentence reveals that there is an obligatory pause between the final verb of SVC1 *dési* ‘go far’ and the first verb of SVC2 *ta* ‘go’ (E.E. Kari, p.c.), suggesting they are distinct constituents.

- (51)  
 a. ...*Banú Ipokuma, Obonogina* ɔ=vón=n éwéey *nónw* ɔ=wála péł *Édá Sombreiro* ɔ=dá réré fún *dési=ín*  
*ɔ=tá jzá=n* m’úlúgbó-éjzi útóm ísen gbódia, oñáíná kúna, nu ínám sáa  
 ‘...At Ipokuma, Obonogina left with his people and waded across the Sombreiro River, **moved and settled in the furthest part** of the wilderness for the purposes of fishing, farming, and hunting’ (Kari 1997:64)  
 b. Single-marking *within* but not *between* SVCs  
 ...ɔ=dá                      réré fún              dési=ín              ɔ=tá                      jzá=n...  
 [3SG.SET2=then.AUX    walk ascend    go.far=FAC]<sub>SVC1</sub> [3SG.SET2=go    stay=FAC]<sub>SVC2</sub>  
 ‘...[moved]<sub>SVC1</sub> and [settled]<sub>SVC2</sub>...’

Under the DUI alternative, it is paradoxical why ellipsis does not take place across clauses as well as within them (cf. English *She<sub>i</sub> talked to me then Ø<sub>i</sub> left*).

Further, under the DUI analysis the Degema single-marking pattern involves simultaneous backward deletion (deletion of material in the first conjunct) and forward deletion (deletion of material in the second conjunct), as discussed in Wilder (1995, 1997). Wilder illustrates that backward deletion and forward deletion are distinct operations subject to different phonological, syntactic, and semantic conditions, and we can therefore understand them as independent operations. However, in Degema when clitic deletion takes place, backward and forward deletion must take place simultaneously, as they do not occur without each other. For example, in example (52) below, the proclitics share featural identity and the second proclitic appears at a conjunct boundary, identified as a common condition for DUI processes. However, deletion of the second proclitic is ungrammatical here and shows no variation across speakers. The DUI alternative therefore overgenerates.<sup>20</sup>

(52) Ungrammatical forward deletion in the absence of backward deletion

- a. Mí=dúw=n                      óyi              \*(mí)=tá=ān  
 1SG.SET2=follow=FAC her/him    \*(1SG.SET2)=go=FAC  
 ‘I went with her/him’ (E.E. Kari p.c.)  
 b. Tatane              o=kótú=n                      óyi              \*(ɔ)=kpéri=n                      ínúm  
 Tatane              3SG.SET2=call=FAC    him    \*(3SG.SET2)=tell=FAC              something  
 ‘Tatane called him and told (him) something’ (E.E. Kari p.c.)

<sup>20</sup> Another aspect of these patterns which make a deletion-under-identity analysis questionable is the fact that clitic ellipsis would be obligatory, whereas ellipsis is nearly always optional (noted overtly in Van Oirsouw 1985: 365). For example, the English sentence *he bought Ø and Ø cooked the chicken* can also surface as *he bought the chicken and he cooked the chicken*. This is in stark contrast with the Degema clitic patterns where the single-marking and double-marking patterns are in complementary distribution.

A small number of cases exist where ellipsis is argued to be a ‘repair’ strategy in which case it is obligatory, e.g. Merchant (2001) on sluicing and repairing island violations and Kennedy & Merchant (2000) on N’-Ellipsis repairing Left Branch Condition violations. However, I do not see these cases of obligatory ‘repair’ ellipsis as relatable to the Degema facts presented here.